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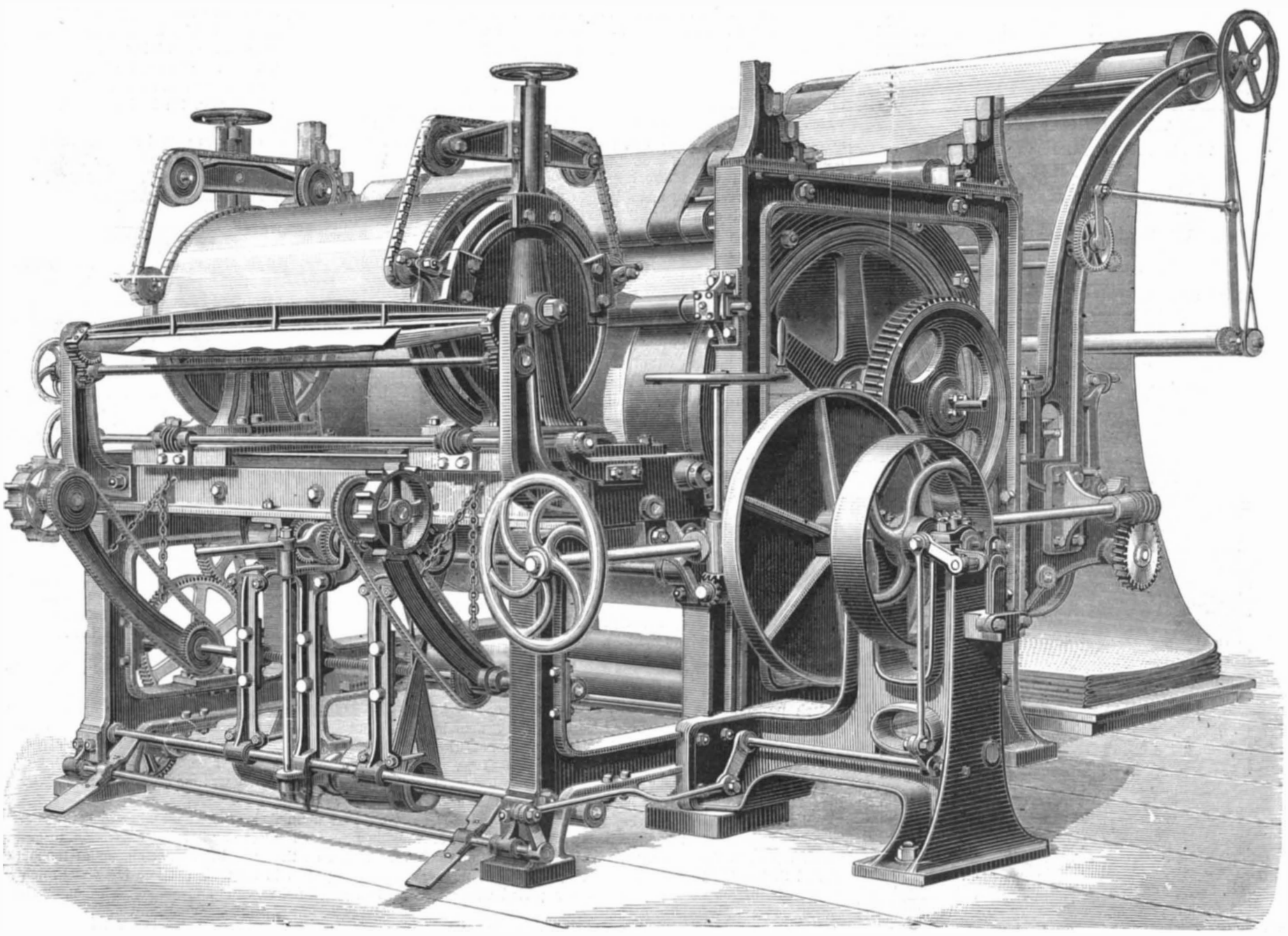
MACHINES FOR FINISHING FABRICS.

In the finishing of woven fabrics there are embraced a number of operations, according as the articles to be treated are of wool, cotton, silk, or a mixture of these, one forming the warp and the other the woof. The nature of the finish also varies, being hard or pliable, lustrous or dull, as the case may be. In addition, some tissues are treated with such materials as starch, dextrine, glycerine, gum arabic, gum tragacanth, etc. Two perfectly distinct operations are quite commonly confounded under the term "finish." The first of these consists in loading the threads with one of the materials above mentioned, and the second is a purely mechanical treatment. Cotton goods and some mixed fabrics of wool and cotton undergo both operations, being first charged with the finishing materials and afterward submitted to mechanical treatment to dry them. Silks of medium quality and articles mixed with cotton receive a small quantity of size, and are afterward passed through the machine. Fabrics of combed and carded wool receive a mechanical finish only. In finishing cotton fabrics the glazing material is applied, and they are then calendered on cylinders heated by steam, which gives them stiffness. But usually mechanical finishing is not resorted to, although it would be a great help. For fine cotton fabrics, however, and for carded and mixed woolen articles, it is indispensable to employ machines, so that the threads of the warp, and especially those of the woof, may be stretched, and thus given the rigidity necessary to make the fabric as stiff as it was in its raw state. The machines used for this purpose are costly, take up much room, and necessitate the employment of experienced workmen. This kind of machine applied to the treatment of fabrics, woolen and mixed, does not give a complete result, and necessitates a complementary operation. The two machines constructed by Messrs. Pierron & Dehaitre, of Paris, France, one of which is shown below, are a great improvement in this respect, and have been very favorably received by manufacturers of woven fabrics. The first of these consists of a large copper cylinder, four to five feet in diameter by four and a half to five and one-quarter feet long, heated by steam.

An endless felt cloth covers nearly the whole surface of the cylinder, with the exception of the places necessary for the fabric to enter and leave the machine. The tension and separation of the felt is effected by rollers. In this machine, as shown in the engraving, the piece of goods is wound on the roller in front. Pressure brakes allow the tension of the fabric to be varied. The fabric, which may be passed over a vaporizer before entering the machine, is kept at its proper width by the tension and pressure of the felt. The steam which forms in the fabric is imprisoned therein, and has the effect of isolating the filaments from each other and of swelling out the threads, thus giving the finished goods greater thickness and greater closeness of texture. The wrong side of the fabric is placed in contact with the cylinder and the right side is turned toward the felt, the result being that the wrong side is made smooth, while the grain or nap of the fabric is brought out on the right side.

By this system such operations may be performed mechanically as are ordinarily confided to special workmen of long experience. When the operator feeds the fabric to the felt machine it often happens that he is not sufficiently careful about the selvages, and when the goods are rolled up the ends are irregular; or, if the fabrics are striped or printed, the lines or designs are wavy, and the goods consequently do not strike the eye of the buyer favorably. There are also in woolen fabrics fulled pieces which have narrower parts, that must be brought to a uniform width, an operation that, by hand, presents some difficulty. In order to overcome these difficulties mechanically, and to obtain results superior to those gained by this machine, the manufacturers have added a widening apparatus, which is represented in the annexed engraving. In this the different parts of the mechanism have been strengthened, and the apparatus is provided with a progressive movement (which allows its speed to be varied), and with various arrangements for rolling or folding the goods. This widening apparatus is composed of two disks, covered with caoutchouc, and of endless chains, designed for holding the fabric in place by pressure. These disks can be fixed obliquely to produce the widening, their distance apart being regulated according to the width of fabric desired. On entering the apparatus the fabric passes between the chains and conducting disks; in turning with the oblique disks it widens, and, on reaching the other end, it enters the finishing machine, between the cylinder and the felt, where it is dried. Goods finished with this new apparatus have very even and regular edges, and the threads of the woof being well stretched and pressed, the stripes or other patterns preserve their original arrangement. In the felt machine, as we have already seen, independent of the widening, a better finish is given the goods than by other methods; and the fabric, on coming from the machine, may be folded, and is then ready for the shop. The effect of the treatment on cotton fabrics is to make them soft to the touch, almost like wool.

The finishing machines made by Messrs. Pierron & Dehaitre work with great regularity; and, as a consequence of the advantages that they possess over other systems in use, they are being rapidly adopted by manufacturers in Europe.



IMPROVED MACHINE FOR FINISHING FABRICS.

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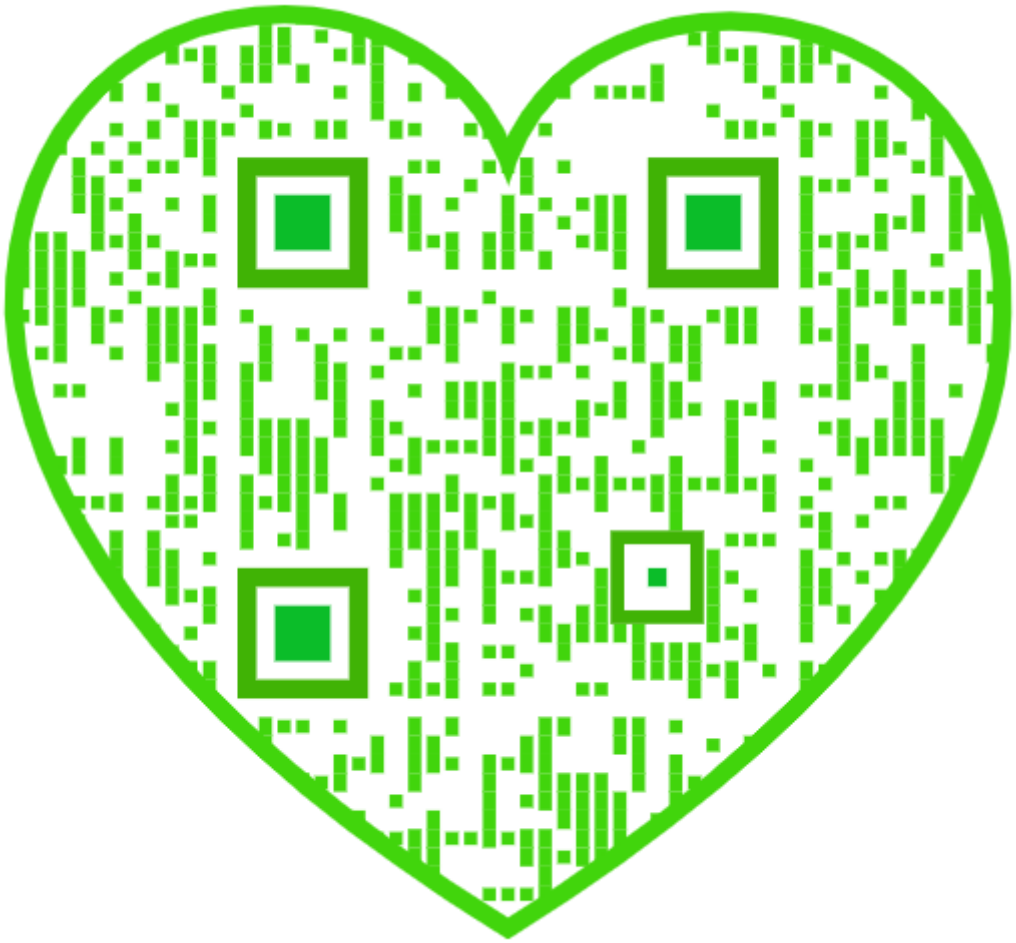

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THE PRESERVATION OF GAS SERVICE-PIPES.

The inconclusive discussion of the means employed for preserving gas service-pipes, by the Associated Gas Engineers of New England lately, seems to point to a field of investigation which some thoughtful inventor may find profit in cultivating.

Secretary Neal, who introduced the subject, laid especial stress upon the destructive influence of the salt in the soil of seaboard places. In Charlestown, Mass., the wrought iron (ungalvanized) service-pipes were sometimes found to be so corroded that the least touch would destroy them; they were as thin as paper. He had no doubt that a great many of their service-pipes were badly corroded, but so long as they were not meddled with they continued to hold gas. A process to make them more durable was greatly needed, and he raised the question whether that end might not be attained by dipping the pipes in some substance like tar or asphalt, or by using a different material than iron for pipes. The cost of all their service-pipes had been written off, as they were considered more perishable than meters. The mains had been charged to construction account until lately, but the service-pipes were considered to be of a more perishable nature, and required to be renewed quite often. He was aware that in some places lead had been used for service-pipes, instead of wrought iron, and it had been suggested that cast iron might be employed; but there were objections to the use of cast iron for services, especially for small ones.

A member of the association said that he had been able materially to increase the life of service-pipes in soft, muddy ground by dipping them in coal-tar. To do this the services were heated not quite to a red heat; the whole length of the service being placed in a trough filled with thick tar. They were dipped right under, and allowed to remain long enough for the tar to fully cover them; then they were taken out, and the heat of the pipes would set the tar so that it was like pitch upon them. In an hour or so it would harden so that the pipes could be handled.

By another member mention was made of the fact that the Cambridge Company had been forced to abandon the use of plain pipes owing to the rapidity of their rusting in the salty soil of that place. Galvanized iron pipes resisted corrosion much better. The galvanized pipes cost fifty per cent. more than common pipes. An equally good result, it was thought, might be secured by using pipes lined and coated with cement, such as are sometimes used for water service. They would be cheaper, though open to the objection that the capacity of the pipe would be materially diminished by the cement lining. Good results had also been obtained by coating pipes inside and out with a mixture of rosin and tar, in about the proportion of a quarter of a pound of the former to a gallon of the latter. The pipe was dipped hot and stood up to cool, when the mixture hardened. Pipes thus treated had been in use twelve years without giving trouble. Another member had prolonged the life of wrought iron pipes by coating them with red lead; this, however, in soil that was not salt. Another kind of soil, which is found away from the seaboard, was mentioned as giving much trouble, and that was ashes used as filling. Laid in such earth, unprotected pipes rust out rapidly.

The President was satisfied from experience that galvanized pipes were much more durable than naked pipes, especially in soils containing salt. He had also learned from experience that pipes rusted much more rapidly in gravel than in clay. Indeed, when laid in clay impervious to water, pipes were found entirely free from rust, while pipes in gravel were completely destroyed. Corroded pipes answered for the gas so long as they were not disturbed; but when the water men came along and disturbed the ground the gas company had to renew hundreds of service-pipes. He might say that five out of six were set leaking by the disturbance of the earth around them, and by the shoveling of the dirt upon them. While the water men did not go to the gutter, they disturbed the pipes sufficiently to start them leaking underneath the pavement. In putting in renewal pipes they always used galvanized iron; and his experience with them indicated that they would last very much longer.

At the close of the discussion, the Secretary expressed his regret that he had not obtained more information that would aid him in obviating corrosive action of the salty soil he had to deal with. Lead pipes were too expensive.

As observed at the beginning of this article, there would seem to be a good opportunity here for investigation and invention. The interest involved is already a large one, and with the increasing adoption of gas as fuel the demand for protected pipes is likely to increase.

WHERE THE LETTERS ARE WRITTEN.

Last fall an official count was made of the letters mailed at each post office in the United States during one week. From this count an estimate has been made of the amount and distribution of the postal business of the country during fifty-two weeks, or the entire year ending Dec. 31, 1880.

The Post Office Department has just issued a statement of the results of this inquiry, which shows that the number of pieces of all classes mailed during the year was 2,720,234,252. The whole number of letters mailed was 1,053,252,876, or an average of 21 for each man, woman, and child in the United States; 324,556,440 postal cards, 812,032,000 newspapers, 40,148,792 magazines and other periodicals, and 21,515,832 packages of merchandise.

The statement is accompanied by a table giving (in alphabetical order) the several States and Territories, the number of letters mailed in each, and the average number to each inhabitant. The two extremes are, naturally, Alaska, with its unlettered population, and the District of Columbia, which, as the center of the postal system and the seat of National Government, must necessarily have more than the normal or domestic and business correspondence. In Alaska only one inhabitant in five is credited with one letter a year. In the District of Columbia there are 85 letters mailed for each inhabitant.

At first thought almost any one would mention as the probable regions of most frequent domestic and business letter-writing the States containing the great business centers, the regions of abundant schools and general literary culture, but he would be wide of the mark. The most letters are written where there is proportionally the largest intelligent adult population who are away from home, namely, the newer States and Territories. Colorado heads the list of letter-writing communities, with fifty-five and a fraction to each inhabitant.

The settlers in Arizona write 32 letters each a year; Dakota (omitting the decimal and giving the nearest integer), 30; Montana, 40; Nevada, 32; California, 26; Idaho, 25; Wyoming, 42.

The States which supply most of the letter-writers of the Territories in addition to being the great seats of manufactures, commerce, and general intelligence, come next: New York, with 42 letters to each inhabitant; Massachusetts, with 39; Connecticut, with 38. In the next group we may put the States and Territories which are near the average in letter-writing activity. They are mostly thrifty agricultural and manufacturing States, with an abundant and settled population. They are Illinois, 22; Maine, 20; Michigan, 20: Minnesota, 21; Nebraska, 23; New Hampshire, 22; Oregon, 21; Pennsylvania, 25; Rhode Island, 26; Vermont, 21; Ohio, 19; New Jersey, 18; Missouri, 18; Maryland, 18; Kansas, 18; Iowa, 18; Utah, 19. [The surprisingly low figures of Ohio may be due to the heavy draught upon its writing population to fill Government positions elsewhere.]

It will be noticed that no distinctively Southern State has yet been mentioned; the people of the South are not letter-writers generally, nor are they as much given to migration as the people of the North. They are more apt to spend their lives within hailing distance of their relatives and friends; and besides, those States carry a heavy population of blacks who are illiterate. The result is the contributions of the Southern States to the mail pouches are strikingly meager. The annual average for each inhabitant of Alabama is 7; Arkansas, 8; Florida, 11; Georgia, 9; Kentucky, 9; Mississippi, 6; North Carolina, 6; South Carolina, 7; Tennessee, 7; West Virginia, 8.

The higher rate of Florida is due, no doubt, to the new element which has gone there of recent years. The same may be said of the three or four other Southern States which markedly outrank the rest of the South in the matter of letter-writing, namely, Virginia, 11; Texas, 12; Louisiana, 15; New Mexico, 13. The more northern States which write the fewest letters are: Delaware, 16; Indiana, 13; Wisconsin, 17; Washington Territory, 15.

In the total number of letters posted annually the more populous Northern States naturally lead: New York, with (in round numbers) 211,435,000; Pennsylvania, 105,237,000; Massachusetts, 69,000,000; Illinois, 68,643,000; Ohio, 61,464,000,

TRADE MARK NOTES.

In England, where registration has been made very systematically for a number of years, a question lately arose as to the right to register words of languages not using the English alphabet. In one case the applicant presented a drawing of a Chinese phenix standing on the bough of a tree, having explanatory words in Chinese characters underneath. In another case, a merchant had noticed that his own name, "Tod," bore the same sound with a word in Arabic signifying "a high mountain;" the Arabic word was therefore presented to be registered. The registrar objected to registering such marks, because he did not think the distinction between different words in a foreign character sufficiently clear, and because he said that he could not be expected to know all the foreign alphabets, and be able to decide intelligently upon interferences. But the English courts said that the marks must be registered; the officer must meet these practical difficulties in the best way he could. Apparently the reason for such a decision would be even stronger under our recent law relative to trade marks in foreign commerce; for, no doubt, words which are not in English characters must often be used upon goods exchanged between the United States and some foreign countries.

Many readers have no doubt noticed the solid red triangle which is employed as a distinguishing device on the labels upon the bottles of Bass's ale. A rival firm of brewers applied to register a triangle which was not solid, but drawn be means of three broad stripes meeting at three points, and having a figure of a church edifice printed within. The court said that this device was too much like that of Bass & Company.

Every year a number of cases arise in which the courts are asked, independent of any law for registration, to grant an injunction on the ground that the claimant of the mark was the first person in the trade to adopt it. One principle which governs in these cases appears not to be fully understood; it is that words which are naturally and properly descriptive of an article, its origin, uses, etc., can not be exclusive. No one is allowed to appropriate words in their ordinary and proper meaning; such uses of them are free to all

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the world. One who wishes to invent an exclusive mark needs to be careful that any words which enter into it are employed in an entirely arbitrary and fanciful sense. In one case reported during the winter, the mark was the phrase "Rye and Rock," applied to a composition of whisky and candy. A very entertaining argument, which, for its humor and literary brilliancy, attracted a good deal of attention among lawyers, was made to show that this was an arbitrary phrase; but the court considered that it was somewhat descriptive of the components used—rye whisky and rock candy; and that whoever used those elements in a similar beverage, had the right to use the same descriptive phrase. Similar was the decision where a clothing merchant called his store the "Tower Palace." The court said that the phrase was in its nature descriptive of the peculiar architecture of the building; it might be exaggerated, but it was of descriptive tendency, and therefore that when the clothier moved away from the building to another stand, he could not object to his successor's continuing to use the name. So the letters "I X L" have been pronounced no trade mark, for the reason that their sound gives them a meaning, and they have been widely used upon various goods. But a cigar dealer who styled his cigars the "Pride Cigars," was sustained in his exclusive claim, because "pride" has no natural proper meaning in such connection. There have been one or two decisions that an arbitrary number—such as "523"—distinctively or fancifully printed, may be protected. There are two English decisions giving considerable support to the idea that a peculiarly woven, party-colored border or selvage of calicoes, woolen cloth, etc., may be a trade mark. The names "Family Salve," and "National System of Penmanship," have received protection to a certain extent.

Within a few years past there have been two or three attempts on the part of manufacturers whose patents had expired, to sustain or continue to control the article, by asserting the exclusive right to the name as a trade mark, but such attempts have not been successful in the courts. Another decision of this class has just been made relative to the Singer sewing machine. As every one knows, the Singer Manufacturing Company had, for a term of years, the monopoly of making the Singer machines, by virtue of the patents; but, when the patent expired, rivals entered upon the business, and, naturally, advertised theirs as Singer machines. One of them was sued by the old company, which claimed that it had the exclusive right to the name Singer as a trade mark. But the court decided that the word "Singer," as applied to sewing machines, is in the nature of a description of their kind and character; hence, whoever has the right to manufacture machines of that kind has the right to advertise and sell them under the designation common in the market. After the patents expired, any person who chose might lawfully make these machines, and, as a consequence, the descriptive name became common property.

A person need not conduct the manufacture himself in order to enjoy an exclusive trade mark on the goods. Such at least is a decision by the New York Court of Appeals. A chemist, who had devised a serviceable composition, sent the recipe to Paris, where the article was manufactured, and he imported it in quantities from time to time, and arranged for its sale by various druggists throughout the country. He had an interest in these sales. As soon as it became popular others commenced making and selling it, and they used his peculiar name for it. He sued; and the infringers contended that, as he was not the manufacturer nor the seller, he could not complain. But the court decided in his favor, saying that the advantage of a trade mark does not necessarily consist in indicating the manufacturer. It may be useful as identifying the quality of the article; and when this is the case, it may be of value to any person interested in putting the commodity upon the market, and he may be the rightful owner of it.

DEAFNESS AS A CAUSE OF RAILWAY RISKS.

Dr. Lawrence Turnbull, of Philadelphia, lately read a paper before the Pennsylvania Medical Society, calling attention to the hazards to life and property due to deafness on the part of railroad men. Locomotive engineers, firemen, and conductors, he said, are liable to affections of the ear, with decrease of hearing, such deafness appearing to be, in his estimation, more dangerous than color blindness as regards the signal code, because the latter is usually a congenital defect which can be defined precisely before the individuals are placed on active duty, while the deafness is an acquired disease, but slow in its approach and sometimes unknown to the person affected; and a cold or injury diminishes the hearing more and more, or destroys it completely, if it is not properly and promptly treated.

After citing cases which had come under his personal notice, and referring to the reports of Professor S. Moos, of Heidelberg, with respect to cases of railway accidents through deafness, Dr. Turnbull dwelt at length upon the evidence collected by Ludwig Hirt.

In order to gain an unprejudiced opinion, Hirt traveled repeatedly on the locomotive. His longest uninterrupted journey covered 325 English miles. He notes the following causes which act on engineers and firemen when traveling: First, the violent concussion; second, the uninterrupted straining of the eye and ear; third, the cutting air (less noticeable on the engines provided with a protecting roof); fourth, the continuous erect position; fifth, the frequent change of temperature. The occasional troublesome or noxious influences are dust and irrespirable and poisonous gases. Hirt observed on himself and young firemen an increased frequency of pulse and respiration, pain in the knees and the calves of the legs, exhaustion, weariness, and excessive thirst and nausea, which, however, soon disappear. Whenever he traveled thirty-five to fifty miles without a stop, vertigo was perceived, associated with violent roaring in the ears, and he felt the urgent need of something to cling to. In addition to these symptoms, we have in the case of engineers and firemen the mental exertion of the most careful watchfulness and uninterrupted exertion of the higher organs of sense. Regarding the results of long years of traveling on the engine, Hirt says that, taking all in all, an engineer who averages seventy-five miles daily, or, in round numbers, 25,000 miles a year, may be as sound and robust after twenty years' service as he was in the beginning, providing he was then healthy and that he has met with no accidents. If we examine, says Hirt, a large number of engineers who have been long in the service we find that a majority of them are robust, sunburnt men, with well developed faculties, good digestion, and in an excellent state of health. The minority, however, in whom we see the disastrous results of their calling, must not be forgotten.

Dr. Turnbull recommended that all candidates for railway service should be examined by a competent physician, who should test them with special reference to their hearing. He also advised that the company's physician should report to the superintendent of the road every case of deafness discovered in trainmen, provision being made for the transference of men of impaired hearing to other positions where perfect hearing is less vitally important.

DANGERS OF DENTISTRY.

Usually dental surgeons take great care to keep their implements clean. Sometimes, however, the patient is disgusted with the sight of more or less ancient blood stains on forceps and other implements which are to go in his mouth.

A correspondent in Maine submits a local newspaper report of an accident to a Bangor dentist which suggests the query whether there may not be danger of blood poisoning to the hazard of the patient's life when the surgeon is not careful with respect to the cleanliness of his implements. In the case reported the accidental pricking of a finger with a sharp instrument used by the dentist while filling a tooth, resulted in a serious case of pyæmia. In this instance the dentist was the sufferer. Suppose the poisoned tool had pricked the gum of the patient? Whether the poison came from the diseased tooth then being operated on, or was due to some previous operation, does not appear, and would not much matter to a patient who should be poisoned in that way. In either case the injury might be fatal. From a moral point of view, however, it would make a great difference whether the patient furnished the poison or the dentist. It goes without saying that untidiness in the dentist's chair is dangerous as well as disgusting, and should not be tolerated.

A MUSHROOM FARM IN MAMMOTH CAVE.

BY H. C. HOVEY.

A novel proposal has lately been laid before the trustees of Mammoth Cave, Kentucky, and is now held under consideration by them with some prospect of a favorable answer. An enterprising Frenchman, who has already had experience in mushroom culture in the vicinity of New York city, complains that he finds no cellars sufficiently large for his increasing business, and also that the conditions of temperature and moisture are not uniform enough to insure the best results; and therefore seriously offers to rent a portion of the cave for the purpose of raising such varieties of edible fungi as may be found best suited to the locality.

This will not in the least interfere with the exhibition of the wonders of the great cavern to visitors. Many square miles of it are never seen by tourists at all, for the reason that their time is usually limited, and they have enough to do to follow the guides through the selected routes. The portion mentioned as possibly to be devoted to mushroom beds is what is known as "Audubon's Avenue," the first passage to the right after entering the cave, and therefore quite convenient of access. This avenue is said to be about half a mile long; and formerly cottages stood at its entrance, built for the use of consumptive patients, under the erroneous impression that the chemically pure air and the uniformity of temperature would more than compensate for the absence of sunlight and the cheerful sights and sounds of the upper world. The cottages are now forsaken and most of them demolished, and the long tunnel beyond contains little of special interest, unless it be the swarms of bats that hibernate in what is for that reason called "The Great Bat Room." The rich deposits of bat guano, that have been accumulating for centuries, lie as yet undisturbed, and if properly mixed with other fertilizers, might no doubt be used to facilitate the propagation of fungi.

The soil, which at present is extremely dry, might be easily moistened to any desired degree, as was done in working the saltpeter mines in former days, by conducting water through pipes from the cascade at the mouth of the cave.

The idea of thus turning caverns to profitable account for the cultivation of mushrooms, though new in America, has long been a familiar one in France, and has been demonstrated to be entirely practicable. One of these caves, at Montrouge, is said to have six or seven miles' run of mushroom beds, and the daily yield of marketable fungi is about 400 pounds weight. Another such cave, near Frepillon, is reported as sending, on favorable days, as many as 3,000 pounds of mushrooms to the Paris market, from beds aggregating sixteen miles in length. Still another, at Mery, and belonging to M. Renaudot, is said to have had under cultivation in 1869, over twenty-one miles at once, and afforded employment to a large class of laborers, who devoted themselves wholly to the business of raising mushrooms, not only for the French markets, but also for exportation. One house alone reports 14,000 boxes of preserved mushrooms as sent to England in a year.

The special advantage of subterranean over open air culture lies in the fact that, owing to the uniformity of temperature, which in Mammoth Cave hardly varies from 56° Fah. either winter or summer, the business can be pursued with equal success at all seasons of the year and in all kinds of weather.

It is the supposition that when choice mushrooms are known to be raised by responsible parties, and with every guaronsee of freedom from the admixture of poisonous fungi, they would find a ready market in Louisville, Cincinnati, and other Western and Southern cities; or, if not, they could be hermetically sealed or made into catchup and easily sent to more distant markets, where such esculents are appreciated. The business has become highly remunerative in England as well as France; a fact brought out lately in the trial of the Metropolitan Railway Company, for taking possession of a mushroom nursery, showing that this curious branch of horticulture yields from 150 to 200 per cent. One witness is quoted as saying that, "if $250 were expended, in twelve, or possibly in six months, the sum of $1,000 would be realized."

It is probably an error to regard the economic value of fungi as of unimportant character; and it is worth considering, in these days, when so much has been said on the importance of multiplying the materials of cheap and wholesome food, whether such immense quantities of nutritious fungi ought to be annually lost, either by reason of ignorance of their excellent esculent qualities, or through fear of serious consequences arising from eating those kinds that are unfit for food. Caution should not degenerate into prejudice. And really the difficulty of telling edible from poisonous fungi is no greater than that of discriminating between the poison ivy and harmless ampelopsis, or between the wild and cultivated parsnip. A very little attention to the subject will enable any one to tell at sight a few of the best and most common varieties as readily as he now tells the vegetables from the weeds in his garden. It may be added that, in fact, the cultivation of the mushroom has been mainly restricted to a single species, so that most people who are fond of it, will hardly recognize any other as fit for food; while there are many varieties of esculent agarics known to the mycophagists, some of which, no doubt, might be found by experiment to be as suitable for cultivation as the common *Agaricus campestris*.

Our knowledge of American fungi is known to be extremely meager, being mainly limited to the results of researches in the Carolinas, Texas, and Cuba, made by Curtis and Ravenel; and a wide field of investigation is open to any competent person who will specially devote himself to this branch of botany.

Increased Importance of Iridium.

Mr. Holland's process for fusing and moulding iridium enormously widens the scope of the useful applications of iridium, and gives increased importance to any natural sources of the metal that may be discovered. The *Standard*, of Portland, Oregon, states that certain heavy black particles associated with gold in that State, and hitherto supposed to be iron, have been found to be iridium. The *Standard* says that the iridium appears as a black shiny sand in the gold washings, in particles a little coarser than blasting powder, and adds: "There are portions of this State and the adjoining Territory where this metal may be found in abundance. So that we have in our midst an undeveloped source of wealth that may outshine anything ever before known."

Moth Preventive.

A correspondent of the *Furniture Gazette* recommends the following remedy for exterminating moths in carpets and furniture: After some years of experience with the troublesome pests, says the writer, I found a sure preventive of moths in pitch paper, the same as roofers use. The moth will live and grow on cayenne pepper and tobacco, while I never could see that the use of these articles kept the moth miller out. The plan for the furniture dealer or housewife is to cut the paper in slips and place about the room, under and behind sofas, chairs, etc.; this should be done as early as the middle of April, and in warm climates earlier. If the dealer wishes to make parlor suits moth proof, he should place on the inside of backs of chairs and seats, small strips of the pitch paper, and rest assured that the miller will not select these places to deposit eggs. It is the miller that is the foundation of all the mischief.

A Heavy Mississippi Tow.

The towboat Oakland left St. Louis for New Orleans May 15, with the heaviest tow yet taken seaward that way, namely, eight barges carrying freight as follows: 160,000 bushels of wheat, 140,000 bushels of corn, 5,000 barrels of flour, 3,000 sacks of bran, 6,000 sacks of oats, 5,000 packages of general freight. The total tonnage exceeded 10,000 tons. Most of the grain was for export.

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The Lyman-Haskell Multicharge Gun.

Work has been begun, in the pattern room of the Reading Iron Works, on the first Lyman-Haskell accelerating or multicharge cannon. The gun will be twenty-five feet long and have a bore six inches in diameter. Along the bore four pockets will be located, in each of which a charge of powder will be placed, with the view of accelerating the speed of the ball after it leaves the chamber of the gun and during its progress through the bore. The charge of powder will be 130 pounds, and the weight of shot 150 pounds. It is calculated that a shot from the gun will penetrate through two feet of solid wrought iron. The expected range of the gun is ten or twelve miles.

NEW BENDING MACHINE.

The common method of bending wrought iron bars practiced in many shops is to make a cast iron form, around which the heated bars are bent by hand. In the way, uniform shapes are produced at a slow rate, and with severe and exhausting labor, and withal requiring considerable skill on the part of the workman.

We illustrate a bending machine to which cast iron forms are attached, between which the work is bent by power with great rapidity and accuracy, requiring no skilled labor in the operation. Its capacity is limited only by the amount of work that can be heated and placed in or removed from the machine.

The engraving shows a pair of dies or forms attached for bending iron plow beams, and at the side of the machine a plow beam after it has been bent is also shown.

There is hardly a crooked piece of wrought iron about a plow, wagon, thrashing machine, engine, mining or railway car, reaper, seed drill, or other machine, using bent pieces of wrought iron that cannot be bent on this machine with a great saving of time and labor. Much of the work that has been done on punching and drop presses is being done on this machine. It covers an area four by thirty-six inches.

The cross head moves seventeen inches and gives one stroke, while the tight and loose pulleys make forty-eight revolutions, thus giving a great leverage. Its weight is five thousand pounds.

We are informed one purchaser of this machine has over forty different patterns of dies or forms. It is manufactured at the Moline Iron Works, of Williams, White & Co., and is used in many of the largest works in the country.

Coal in Manitoba.

The people in Manitoba are rejoicing over the discovery of an important bed of coal, twenty-five miles northwest of Emerson. The bed is six feet thick, for two-thirds of its thickness very pure. Prof. Tilley describes it as a first-rate coal for general purposes. The bed is nine feet below the surface, under a stratum of red fire clay. It is thought to extend over a large area, and great advantage to Southern Manitoba is anticipated from it

NEW PUMPING ENGINE.

In many cities and villages the water supplied by the public works is unsuitable for toilet, potable, and culinary purposes, because of its hardness or the presence of earthy or vegetable impurities, and many families continue to use rain water from reservoirs or tanks placed in the attic, and others would prefer to do so but for the labor of pumping. Generally these reservoirs are supplied by pumping by hand from a cistern in the basement—a laborious operation, affording an unreliable supply, because it is frequently neglected by the person having it in charge.

The engine shown in the engraving is designed to do this work by using the hydrant water for power. It will be noticed that the apparatus has two cylinders, one being a hydraulic or water engine, operated by the water from the street mains, and conveying power through the piston rod to the other cylinder, which is a pump, taking water from the cistern and discharging it through suitable pipes into the reservoir above. It can be set in motion or stopped by hand, or it may be automatically controlled by a float in the reservoir arranged to open or close a valve in the service pipe.

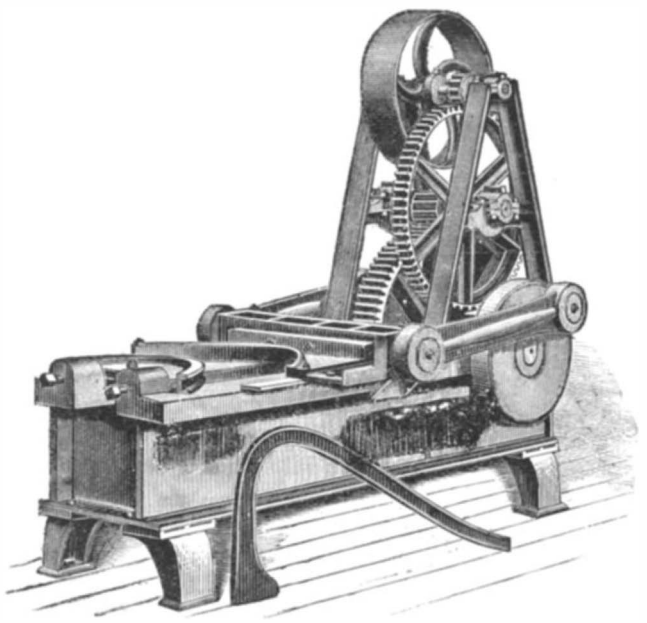
The water from the engine may be used for irrigating lawns, or other purposes that do not require it to be raised to any considerable height. A number of these engines have been in use for one to two years, with the most satisfactory results.

The size of cylinders must be in proportion to the pressure in the service pipe, and height of reservoir above the cistern. A safe rule is to calculate that one pound pressure on the engine will raise the cistern water one foot, the two cylinders being of equal size. Unless otherwise ordered, cylinders of equal dimensions, 3 inches diameter by 4½ inches stroke, are supplied. This size will pump from 75 to 100 gallons per hour from the cistern into the reservoir, and will require about the same quantity of hydrant water for power. Larger sizes for hotels and factories are made to order.

The Holly Manufacturing Company, of Lockport, N. Y., are makers of this pumping engine. New York office, 157 Broadway.

The Sub-Treasury Gold Wagon.

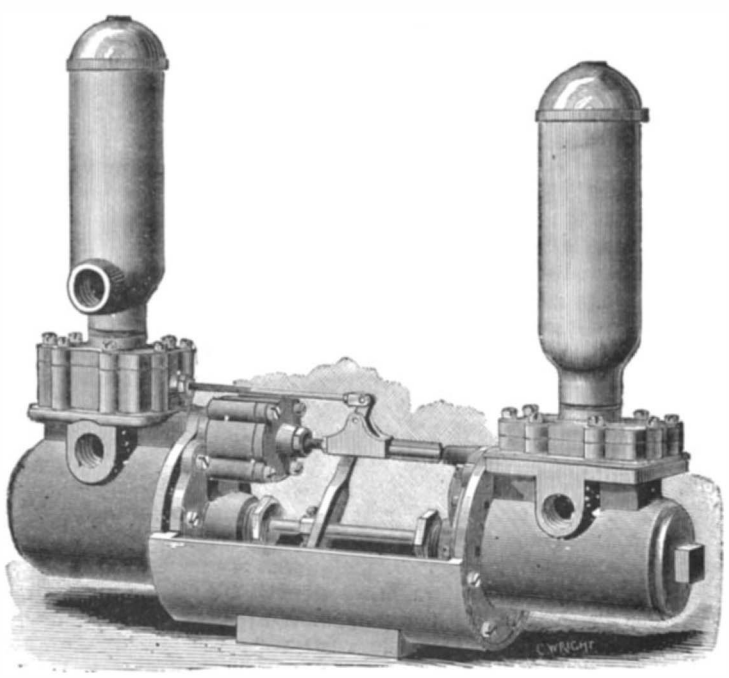
The little dingy-looking "gold wagon," which has been used for twelve years past to carry the money received for duties from the Custom-house to the Sub-Treasury, has been retired from service. Sometimes it made as many as a dozen trips daily, carrying as much as $80,000 in glittering gold coin each time. The money was usually put up in bags of $20,000 each, which were placed in heavy oaken boxes with massive rod-iron handles. These boxes were then put into the wagon-box, and a lid with clamps of iron was locked down over it. The wagon was pushed like a hand-cart by two Custom-house porters, accompanied by an armed watchman, whose duty it was to see that the load of treasure was not interfered with by thieves. The little used-up wagon has carried in its time probably not less than $500,000,000, or about 4,500 tons weight in gold, and the dead weight and strain of the precious freight had rendered it rather rickety and unsafe. In its place a new wagon has been purchased, with solid wheels girt with iron tires half an inch thick, painted a deep blue color, and marked with the sovereign letters "U. S." in front.



BENDING MACHINE.

When Men are at their Best.

Dr. Beard states that from an analysis of the lives of a thousand representative men in all the great branches of the human family, he made the discovery that the golden decade was between forty and fifty; the brazen between twenty and thirty; the iron between fifty and sixty. The superiority of youth and middle life over old age in original work appears all the greater when we consider the fact that all the positions of honor and prestige—professorships and public stations—are in the hands of the old. Reputation, like money and position, is mainly confined to the old. Men are not widely known until long after they have done the work that gave them their fame. Portraits of great men are delusions; statues are false! They are taken when men have become famous, which, on the average, is at least twenty-five years after they did the work which gave them their fame. Original work requires enthusiasm. If all the original work done by men under forty-five was annihilated, they would be reduced to barbarism. Men are at their best at that time when enthusiasm and experience are almost evenly balanced. This period, on the average, is from thirty-eight to forty. After this the law is that experience increases, but enthusiasm decreases. Of course there are exceptions.—*Christian Intelligencer.*



GASKILL'S HYDRAULIC PUMPING ENGINE.

MISCELLANEOUS INVENTIONS.

An improved saw tooth has been patented by Mr. Elisha S. Snyder, of Snyder's Mills, W. Va. This invention is designed to protect saws from all unnecessary wear; it consists in an expansible concavo-convex steel plate, which is inserted endwise between the ribbed edge of a slot cut in the periphery of a saw and the grooved edge of a false tooth which is keyed in the slot.

An improved vehicle spring brace has been patented by Mr. Zachriah T. Bush, of Stanton, Mich. This invention relates to that class of vehicles in which the springs are arranged at the sides instead of parallel with the axletrees. It consists in a brace of novel construction combined with the side springs and with reaches extending from the axletrees.

Mr. Louis E. De Grand-Val, of Jersey City, N. J., has patented a simple and efficient jar for the package and transportation of fresh milk, but which may also be used for other purposes; and the invention is embodied mainly in the device for clamping the cover thereon.

An improved life raft, which is made of very few parts, can be folded and disconnected for storage, or built up for use very easily, and is so constructed that either side will serve as a top, has been patented by Mr. Frederick S. Allen, of Cuttyhunk Island, Mass. The life raft is formed of two like frames, which are attached to empty casks by means of clamps, and thus form a double raft supported by three casks. A series of guide rods pass from one frame to the other and through a sliding floor, which can be drawn to either frame by means of ropes, thus permitting the raft to be thrown overboard without regard to its position, as the sliding floor is drawn to the upper frame as soon as the raft has been launched. Oars, masts, etc., are attached to the ends of the sliding floor. Bars or rods are pivoted to the ends of each of the frames, and are connected at their outer ends by ropes, thus forming railings when erected.

Mr. James Forsyth, of New York city, has patented a currycomb so constructed that it can be readily adjusted for combing the manes and tails of horses and scraping sweat, dust, and mud from the animals. The invention consists in a currycomb with a reversible comb upon its back, projecting arms to support the comb, and a spring catch for holding the reversible comb in either position.

Mr. William A. Roos, of New York city, has patented a simple and convenient attachment to a chair. The device is so contrived that a slight movement of a pedal will operate the fan.

An improved double-acting force pump has been patented by Mr. Andrew J. Hopkins, of Richmond, Ind. It is of the class of submerged force pumps in which a single double-acting cylinder is used. The object of the improvement is to provide a pump which shall be simple and efficient in its action, and at the same time so constructed as to avoid the inconveniences incident to freezing.

Messrs. William H. Leininger and Oliver H. P. Cornelius, of Salem, Oreg., have patented an improvement in whiffletrees. The invention consists of springs set about the drawing bolts in the ends of the double and single trees.

Mr. Joseph D. Paldi, of Brockway, Mich., has patented a cheap, simple, and efficient means for fastening two parts of a rope together, no matter whether this rope be of a fibrous character or made of wire. The invention consists in a strong flattened tube of wrought or malleable iron, through which the two parts of the rope are passed. In this tube are combined two metal wedges, which are driven in at opposite ends of the tube, so as to pass between the two sections of the rope and crowd it tightly against the sides of the tube, to firmly hold the two parts of the rope and the tube together, the wedges being so arranged that the pull on the two parts of the rope always tends to draw the wedges more tightly into the tube.

An improved window guard for the safety of persons engaged in cleaning or repairing windows, has been patented by Mr. George Neu, of Cincinnati, O. The invention consists in a bar having a swiveled fork attached to one end, and a screw passing into a fork attached to the other end, to lock this bar in the window frame, so that it can hold the person by means of a strap passing around the bar and attached to a belt passing around the person engaged with the window.

An improvement in rowing gear has been patented by Mr. Fred D. Smith, of New Carlisle, Ind. The object of this invention is to provide a device by means of which a boatman may pull a boat in the direction in which he is facing.

A mill especially designed for grinding feed, operating with a reciprocating motion, and adapted to be attached to the pump rod of a windmill, has been patented by Azel H. Bell, of Belle Plaine, Iowa.

An improvement in nose feed-bags has been patented by Mr. Charles J. Gustaveson, of Salt Lake City, Utah Ter. The invention relates to improved seams for uniting the sides and bottom of a nose bag, and also to a ventilator formed in the bottom of the bag and provided with a hinged cover to tightly close the bag when it is to be used for holding water or chop-feed.

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THE KEELY MOTOR DECEPTION.

Three lectures on the Keely Motor were delivered in this city—May 16, 18, 20—at Chickering Hall, by Mr. O. M. Babcock, of Philadelphia, for the avowed and singular purpose, first, of showing to the New York public how grossly they have been defrauded by the Keely Motor Company; second, to show the hardship that the inventor of the "motor" now suffers in having lost or surrendered some fifty thousand dollars in money, being part of his share of the financial plunder originally derived from his stock; third, to explain the exact nature and practical operation of the motor, and thereby to let the people see for themselves that the thing is not a myth or a deception, as so many believe, but a real, genuine discovery, of remarkable, far-reaching, useful character.

It was in respect to the explanation of the practical working of the pretended motor that we were chiefly interested, and we accordingly sent our reporter to the several meetings. We regret to be obliged to say that all three of the performances were puerile and empty so far as the delivery of any actual information was concerned.

The first evening was almost wholly devoted to the recitation of a mass of indefinite charges of fraud alleged to have been practiced, from the very organization of the Keely Company, in 1871, down to the present time, by its managers. But the speaker did not venture to name any of the guilty individuals.

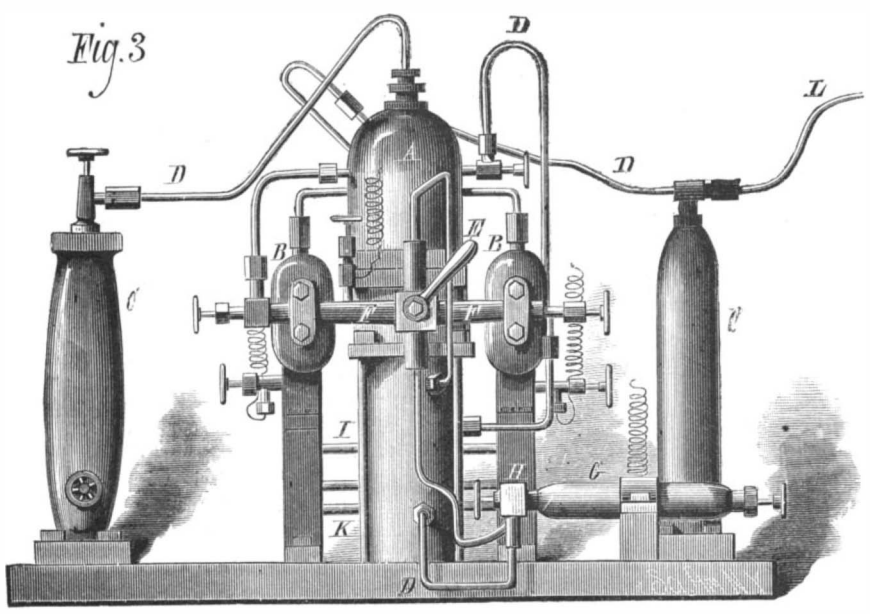
The second lecture was mainly a preface to the great and astounding revelations concerning the practical working of the motor. It consisted, however, only of a collection of extracts from the lingo with which Keely and his followers have always been accustomed to mystify their hearers. Here is a specimen from the evening's palaver:

"Water moved earth, air moved water, ether moved air. Vibrations natural to air would disintegrate water, while air was broken into pieces if it were forced into vibrations common to ether in transmitting light. The compressibility of an elastic fluid was in the exact ratio of the tendency to expand. This was the secret of the Keely Motor."

There we have the general principles of the machine in a nutshell; and now we come to the third lecture, in which large diagrams of the motor were exhibited, with which the speaker pretended to explain the practical operation of the contrivance as follows, which is as near as possible a verbatim report:

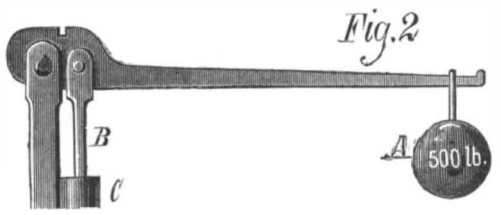
Fig. 1 represents the first practical engine Mr. Keely made. He had built seven or eight engines before this was constructed, each being in turn rejected; and the one now in use (Fig. 4) was the tenth or eleventh. Fig. 2 represents the lever upon which the pressure was indicated. When a pressure of thirty thousand pounds was indicated on the lever, you had a pressure of ninety thousand pounds in the "stand-up tubes" in the "generator" (Fig. 3). That was the first time this fact, the speaker said, had ever been stated in public; and he thought that if the gentlemen who had witnessed the experiments had been told of it at the time, they would not have been anxious to remain in the room to the close of the exhibition.

Fig. 3 represents the "generator" in which the gas or ether was obtained, and was the fifth that had been constructed. It consisted of a "central column," A, having four chambers; two "side columns," BB, each having one chamber, with descending tubes connecting with the lower chambers of the central column; two "stand-up tubes," the "front stand-up tube," C, and the "back stand-up tube, C;" "copper leads or tubes," D, bringing all the chambers of the generator into connection; the "hand lever," E, attached to the starting bar, F, the bar communicating with all the chambers and leads. The chambers inside the apparatus contained water, and were filled to a definite height, slightly compressing air into the upper portion of each chamber, thus producing an air cushion, which operated to give an introductory impulse to the agitation of the water, which, being expelled downward, aided by the action of gravitation, passed through a complex device situated in the center of the central column (a "core" running perpendicularly from top to bottom), which dispersed the water into "tenuities," increasing as it proceeded downward through the stages of spray, mist, vapor, etc., into a highly elastic gas or ether. The turning of the hand lever, E, opened a "four-way" valve in the center of the "starting bar," and disturbed the equilibrium of the water, the opening of the valve producing what might be termed a "vibratory undulation" in the water throughout the entire apparatus. It was produced by the "impulsion" from the air cushions in the upper portion of the chambers, compressed slightly by the filling of the chambers with water. By means of the agitation thus produced, a minute globule of water was forced through the portion of the apparatus called the "expulsion tube" (the core of the central column), and dispersed from the "lower cell" at the base of the central column into an adjacent chamber called the "undulating" or "cord" tube, G, and through a copper lead into the adjacent chamber marked C, by means of the compressing cock, H, which could be operated and closed instantaneously. The globule of water, in its descent through the "central column" and "expulsion tube," expanded into vapor, and was forced successively into smaller chambers. It was met in its course downward by opposing currents from the side chambers, coming from the "molecular leads," I, and "atomic leads," K, and concentrated in a chamber at the bottom of the "central column," not larger than an ordinary walnut, and from

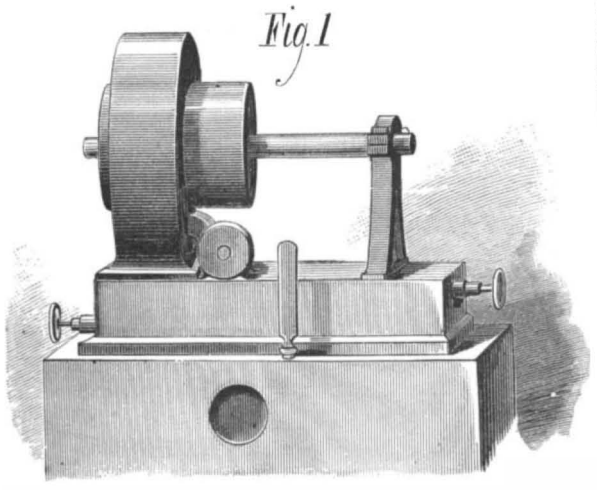


THE KEELY MOTOR.

thence dispersed through a minute orifice into what was called the "undulating tube" or "cord tube," G. The moment that this expulsion took place from the lower cell into the "cord tube," it was closed by means of a compressing cock or "compressor," H, and the vapor in the "cord

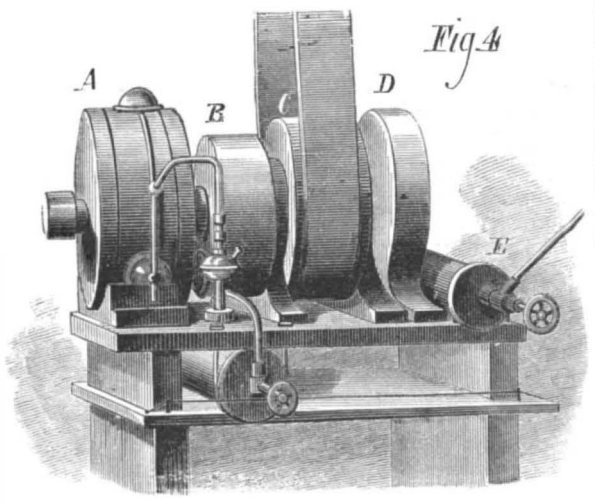


tube" was held intact. In order to repeat the filling of the "cord tube," the compressor had to be opened and closed again. The vapor in the "cord tube" then passed through the "front stand tube," C, being intensified in its action in the passage by means of a device which increased its tenu-



ity as it passed upward. From the upper portion of the stand tube it was carried by the tube, L, to the engine.

Fig. 4 represents the engine as now constructed. It consisted of four compartments, A, B, C, D, upon a bed plate. The first compartment, A, was a cast-iron casing, called



the "positive casing," because it carried the "positive" portion of the apparatus, named as follows: "suspension plate," "wave ring," 150 pins in a "descending vibratory scale," embracing six chords or notes, each chord or note broken up into twenty-five parts, *i. e.*, each pin varied one twenty-fifth of a tone; also six tuning forks, a device called the "compound vitalizing medium," another the "vibratory elliptic," and another the "elliptic shaft," "six elliptic vibratory cells," a "positive wave plate," and "three vibratory transmitters." The second compartment contained what were denominated "triple vibratories" for transmitting "sympathies," and a "vibratory indicator." The third compartment, a pulley, C, upon which the belting run, contained a number of devices called "sextrum," "triple vibratory tubes," and a "vibratory bar" passing through the center. The fourth compartment was called the "spiraphone box," and contained the "spiraphone" and "wave plate." All the devices in the several compartments were within casings, and of course could not be seen in the cut. These several devices were constructed in sets of threes; and, in fact, the different portions of the whole apparatus seemed to be arranged in threes; there were only three movable parts, the valves; the negative tube had a capacity of three pints of water, as compared with the nine pints of the positive tube. They all seemed to be arranged in a sort of "rule of three." The power was transmitted by a belt running over the third compartment. The vapor passed from the generator (Fig. 3) to the engine (Fig. 4) and into what was called the "negative tube," upon the bedplate, adjacent to the spiraphone box, E. This "negative tube" had a capacity of three pints. This was connected with a tube near the center of the engine, under the bedplate, called the "positive tube," which had a capacity of nine pints. From the "positive tube" the vapor passed to the "positive" end of the engine through "copper leads," and there acted in succession upon the various devices in the four compartments—not by pressure, but by vibratory waves or "impulsions."

The generator occupied a space five feet long and high by two feet wide. The engine occupied a space four feet long by two feet wide and high. A fifty horse power engine would not occupy more than this amount of space, and an engine of two thousand horse power could be contained in a room ten feet square. Being rotary in motion, it required no extra room for the movements of its parts; and water and air being the only materials consumed, the cost of running was practically nothing. If the generator were sunk in water it would displace a quantity of water equal to about three hundred times the amount required to fill it; from this the audience could understand how small were the chambers within as compared with the walls. One quart of water would fill all the tubes and chambers. Mr. Keely had produced a pressure upon the tubes alone of fifty-four thousand pounds to the square inch. When you compared this pressure with the eighty or ninety pounds pressure of the steam engine you could appreciate some of the difficulties Mr. Keely had had to contend with in constructing an apparatus strong enough to withstand such enormous force.

The lecturer was asked if it was not possible to construct a machine that would run at a much less pressure than 54,000 lbs. to the inch, and so avoid the dangers and difficulties of so enormous a power as that stated. The reply was that a small pressure machine might be easily made, but what Mr. Keely wanted was to find out the extreme limits of the capacity of his discovery.

Having thus given the "full explanation" of the Keely motor, as publicly delivered by Mr. Keely's chosen representative and bosom companion, the man, according to his own statement, of most authority in the knowledge of the thing, next to Mr. Keely himself, we leave it to our readers to ascertain whether they know any more about it than they did in the beginning. For ourselves we confess that we do not.

New Method of Inlaying Wood.

A new method of inlaying wood has been contrived by a furniture manufacturing house in England. The process is as follows: A veneer of the same wood as that which the design to be inlaid consists—say sycamore—is glued entirely over the surface of any hard wood, such as American walnut, and allowed to dry thoroughly. The design is then cut out of a zinc plate about one-twentieth of an inch in thickness, and placed upon the veneer. The whole is now subjected to the action of steam, and made to travel between two powerful cast iron rollers of eight inches in diameter by two feet long, two above and two below, which may be brought within any distance of each other by screws. The enormous pressure to which the zinc plate is subjected forces it completely into the veneer, and the veneer into the solid wood beneath it, while the zinc curls up out of the matrix it has thus formed and comes away easily. All that now remains to be done is to plane down the veneer left untouched by the zinc until a thin shaving is taken off the portion forced into the walnut, when the surface being perfectly smooth, the operation will be completed. It might be supposed that the result of this forcible compression of the two woods would leave a ragged edge, but this is not the case the joint being so singularly perfect as to be unappreciable to the touch; indeed, the inlaid wood fits more accurately than by the process of fitting, matching, and filling up with glue, as is practiced in the ordinary mode of inlaying.

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Manuscripts on which the Bible Revision is Based.

In a sermon on the revision of the Bible, Rev. Dr. Rylance, of St. Mark's Church, this city, made the following interesting statement respecting the existing early manuscripts of the New Testament. The learned doctor speaks also approvingly of the new version, remarking that the revision was necessary in order that the common people as well as the learned might understand exactly on what ground they stood. Hitherto it has been thought that every word of the English version of the Bible was inspired; this belief is passing away as people become educated and know that no work of a translator can be absolutely perfect. The autographs of the Apostles have long since faded and disappeared. All we have to depend upon for our translations are copies, ancient versions, translations, and the quotations made by the Fathers of the Church. The manuscripts of the New Testament are of two kinds—the uncial, the oldest class of manuscripts, written in capitals and without punctuation, and the "cursive" manuscripts, so called from their being written in a running hand that began to be used in the tenth century. Those of the old class were written between the fourth and tenth centuries, the others after the tenth century.

Of the old there are 130 in existence; of the new about 1,500. The very old and very valuable manuscripts are only five. Of these the Alexandrian Codex was originally discovered at Alexandria, and was sent to King Charles I., in 1628. It is now in the British Museum. Nothing is known of the origin of this, but it is usually assigned to the middle of the fifth century. It is much mutilated, twenty-four chapters of the first Gospel, two of the fourth, and eight of one of the Epistles being missing. The next is the Vatican manuscript, supposed to have been written in the fourth century. A copy of this was never made till 1868, when a *fac simile* was issued. The condition of this is much more perfect. The third manuscript is that in the National Library at Paris, whither it was brought by Catharine de' Medici. This had been overwritten—that is, the parchment had been used for other writings; but, spite of that, the original has been deciphered. It is assigned to the early part of the fifth century. The fourth manuscript is that now at Cambridge. This is the least valuable, as it is much mutilated. It belongs to the sixth century. The manuscript found in 1844 in the Convent of St. Catharine on Mount Sinai by Tischendorf, and copied by him in 1859, is the most valuable of the five, as it contains the New Testament complete. This is supposed to have been written in the fourth century. None of these most valuable authorities were consulted in any of the English versions of the Bible, even in making that of King James' time. The Latin Vulgate, the plentiful cursive manuscripts, and the translations were used. Errors like the Doxology at the end of the Lord's Prayer had crept into the translations, even into the Syrian, which was as old as the second century. The Latin Vulgate was probably an excellent translation, as it must have been made within a few years of the death of St. John. The changes that have just been made have only been made when the weight of authority left no doubt of their necessity. The text is not a question of taste, of like and dislike, but of historic testimony. I expect to see the corrected version win its way into the confidence and the respect of the English speaking people.

Government Examinations of Gun Inventions.

By the act making appropriations for "fortifications and other works of defense, and for the armament thereof, for the fiscal year ending June 30, 1882, and for other purposes," approved March 3, 1881, the President is authorized to select a board, to consist of one engineer officer, two ordnance officers, and two officers of artillery, whose duty it shall be to make examination of all inventions of heavy ordnance and improvements of heavy ordnance and projectiles that may be presented to them, including guns now being constructed or converted under direction of the Ordnance Bureau; and said board shall make a detailed report to the Secretary of War, for transmission to Congress, of such examination, with such recommendation as to which inventions are worthy of actual test, and the estimated cost of such test, and the sum of $25,000, or so much thereof as may be necessary, is hereby appropriated for such purpose."

In conformity with this act the War Department has issued an order for a board of officers to assemble at the Armory Building, New York city, July 13, for the purpose of making examinations of all inventions referred to in the law, and making a detailed report of such examinations, with recommendations as to what inventions are worthy of actual test and the estimated cost of such test. The following is the detail for the board: Brevet Major-General George W. Getty, Colonel Third Artillery; Colonels Z. B. Tower, Corps of Engineers, and J. G. Benton, Ordnance Department; Majors A. R. Buffington, Ordnance Department, and John Mendenhall, First Artillery. Second Lieutenant Frank E. Hobbs, Second Artillery, will report to the president of the board for duty as recorder. The Chief of Ordnance, at Washington, will furnish the board with all the information on the subject in his possession, and all persons interested in such inventions are invited to submit to the board plans, specifications, and models, the mode of construction, cost, etc.

Simple Illustration of Critical Pressure.

Herr Haass describes in the *Berliner Berichte* a simple method of illustrating the existence of the so-called "critical pressure" discovered by Carnelley. A small piece of mercuric chloride is placed in a glass tube which is closed at one end, and communicates at the other with a Bunsen pump. So long as the manometer registers less than about 400 mm. pressure it is not possible to melt the mercuric chloride by heating it; the salt passes at once from the solid to the gaseous state. But immediately the pressure rises above about 420 mm. the mercuric chloride melts.

Correspondence.

The Gamgee Motor.

To the Editor of the Scientific American:

A great many persons are under the erroneous impression that the ammonia engine of Prof. John Gamgee is being built, and the experiments conducted at the public expense; also, that "the lunacy of the author is shared by prominent officials at the Navy Yard in Washington." Permit me to state, through your valuable journal, that the total expense of material and labor is defrayed by Mr. Gamgee; that "the prominent officials at the Navy Yard in Washington" would be pleased to chronicle the successful operation of the "zero-motor," but, like other skeptics, we are willing to wait a "few weeks until all is ready."

JUSTICE.

U. S. Navy Yard, Washington, May 21, 1881.

Non-Rotation of the Earth.

To the Editor of the Scientific American:

You will doubtless think that I am presumptuous when I tell you that I do not believe the earth rotates. My reasons for not believing that the earth turns around every twenty-four hours are simply these: When two objects pass each other, going in opposite directions, they pass *very* quickly, as for instance a bird flying west ought to pass objects upon the earth much more rapidly than when it flies east. But this is not the case. A bird passes no more rapidly going west then when it flies east; a ball thrown against a house in a westerly direction does not rebound any more than when thrown east.

You may send a balloon up above your head and let it stand twenty-four hours, and at the expiration of the twenty-four hours the balloon will be directly over your head. I have studied the reasons given in astronomy and find nothing to refute my observations. Hoping, if I am wrong, you will write to me and set me right, I am yours, etc.,

T. A. KIRKLAND.

Franconia, Pickens County, Ala.

Compound Stern-Wheeler.

To the Editor of the Scientific American:

In your issue of the 15th January last, you have an article headed "Steamboats for South American Rivers." After describing the hull, boiler, and engines of steamer referred to, you state: "They are probably the first compound engines ever fitted to stern-wheel steamers." I now beg to inform you that in 1866 I had a stern-wheel steamer made, in which was put a pair of compound engines made in 1864 by Mr. F. H. Wenham, of London. Wenham's patent double and triple cylinder steam engines are described in the *Practical Mechanic's Journal*, Nov. 1st, 1863, pages 220 and 221.

This steamer, Tadorna Radjah, has been at work ever since, and is probably the most economical and efficient little steamer on this coast.

WM. PETTIGREW.

Brisbane, Queensland, March, 1881.

Oleomargarine and the Butter Trade.

The strongest objection raised against the manufacture and sale of oleomargarine has been that it would ruin the profitable export trade in butter. The alleged danger has been insisted on with much emphasis during the past winter in the Legislature at Albany. The official reports of the United States Bureau of Statistics show, on the contrary, that the quantity of butter exported from year to year steadily and very rapidly increases, while the average price received shows no fluctuations which are not explainable on other grounds than the competition of oleomargarine. The official figures are as below:

Fiscal Year.	Quantities exported in pounds.	Value of Exports.	Average price in currency per pound.
1870	2,019,288	$592,229	—
1872	7,746,261	1,498,812	19 4/10
1873	4,518,844	952,919	22 1/10
1874	4,367,983	1,092,381	25
1875	6,360,827	1,506,996	23 7/10
1876	4,644,894	1,109,496	23 9/10
1877	21,527,242	4,424,616	20 6/10
1878	21,837,117	3,931,822	18
1879	38,248,016	5,421,205	14 2/10
1880	39,236,658	6,690,687	17 1/10
1881 (8 months)	25,793,131	5,214,663	20 1/10

Postal Cards.

The contract for supplying the Post Office Department with postal cards during the four years beginning the first of next July has been awarded to Woolworth & Graham, of No. 76 Duane street, this city, who are the manufacturers under the contract now existing. The first contract for postal cards was made in 1873, providing that one cent cards should be supplied for four years at the rate of $1.39⅞ per 1,000 cards. The price under the second contract, which will end the 30th of next June, has been 69 56-100 cents per 1,000 cards. Under the new contract the rate per 1,000 cards will be 54 43-100 cents. While the contract from July 1, 1873, to June 30, 1877, was pending, the number of cards issued was 550,619,500. Under the contract for the four years' term which will expire June 30, 1881, the number issued will reach about 990,000,000. The number required during the next four years will be, it is estimated, 2,000,000,000.

A representative of the *Evening Post*, in an interview with the person in charge of the postal card department, is informed that more postal cards are used in this country than in any other, and probably at least half of them were employed for business purposes, such as advertisements, notices of meetings, etc. Immense quantities of them were taken by the Post Office in Chicago, which received more than any other city except New York, and he said that the sales of one cent postal cards at the New York office now averaged about 100,000 a day. The domestic cards were disposed of chiefly in lots of from 1,000 to 10,000, fully three-quarters of all which were sold being used by business firms, companies, associations, etc. Lots of 5,000 were very commonly taken, those of 25,000 were not infrequent, and even 50,000 had been sold in a single installment. Reference to the books of the office showed that 25,377,150 one cent cards were sold in this city during 1879, and 28,082,800 during 1880, making the total for the two years 53,459,950. The increase in 1880 over 1879 was 2,705,650.

Comet I. 1881.

Thus far comets have played a small part among the portents of this momentous year. Four months have passed without one trailing wanderer in the celestial depths. That inveterate comet seeker, Professor Swift, succeeded on the first day of May in picking up an infinitesimal member of the family, too small to be seen in anything less than a powerful telescope. No other observer has thus far had a peep at the stranger, and there seems to be little probability of its growth into one of those monstrous prodigies, spanning the heavens, that a few centuries ago were such frightful omens of evil to those who witnessed them. The comet that made its appearance May morning will probably do little harm to our planet. It seems to be a bearer of good fortune, instead of a prophet of disaster, for the discoverer will win a prize of two hundred dollars, as well as a gold medal. Comets must hurry their footsteps to make this a comet year. More than one-third of the "great year," 1881, as astrologers call it, has already slipped away, with only one tiny comet recorded on its annals. Prizes of two hundred dollars each are in readiness for seven more comets to be discovered before the year fulfills its course. These astronomical tidbits are therefore more earnestly desired by comet seekers than they are dreaded by those whose superstitious fears regard them as heralds of destruction. The nineteenth century chronicles the advent of two superb comets, that of 1858 or Donati's comet, and that of 1861. According to the law of averages, we can hardly expect again visits from such distinguished members of the family before the century closes. But we shall see as time passes what the future has in store, for nothing is more uncertain than the advent of these mysterious strangers, and one may suddenly beam upon our vision when we least expect it. There are but two things to fear, a great comet plunging headlong into the sun, or one coming into collision with the earth. The probabilities that these events may occur are of the slightest kind, and need not give the least anxiety.—*Providence Journal.*

Grinding Chilled Car Wheels.

The following statements in regard to the economy of grinding the chilled treads of car wheels are officially certified to by officers of the motive power and machinery departments of the roads named.

During the year 1880, the number of wheels ground at the Sacremento shops of the Central Pacific road was 3,400, of which 510 were new wheels. Of the 2,890 old wheels ground, ninety per cent were more or less flattened. The cost of grinding is estimated as follows:

Labor in running the Gowan machines	$1,347.13
Emery wheels	1,075.34
Repairs of machines, and lubrication	438.00
Power	250.00
Royalty, 50 cents per wheel	1,700.00
Interest on cost of four machines	320.00
Yearly depreciation of same	400.00
Add for contingencies 10 per cent	555.05
Total cost	$6,083.52

The cost of replacing with new wheels the 90 per cent or 2,601 flattened wheels that were worthless except as scrap (including interest on 1,300 new wheels to be kept in stock, and deducting value of old wheels as scrap at $8.50 each), is estimated at $24,578.77, from which deduct $4,653.19, or $1.78·9 per wheel, for grinding the 2,601 wheels, leaves $19,925.58 as the total saving by the use of the machines.

A New Method for the Analysis of Oils.

The author treats a measured quantity of oil with a measured quantity of standard caustic alkali. Ten c.c. of oil measured with a pipette were heated in a boiling water bath for an hour with 20 c. c. of a solution of potassa, which would neutralize 123 c. c. of sulphuric acid at 98 grms. =1000 c. c. At the end of this heating the linseed oils mentioned in the previous memoir all yielded a cake of soap solid or very firm when hot, always solid when cold, and easily separated by mere draining. The alkaline solution is very differently acted upon by different samples. It still neutralizes smaller quantities of acid, differing in case of every sample.—*E. J. Maumene.*

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RECENT INVENTIONS.

Mr. Jeppe Jeppesen, of Provo City, Utah Ter., has patented an improved machine for dressing both sides of boards at once for dressing the edges at any angle desired, for tonguing and grooving, cutting mouldings, and other varieties of work in wood. The inventor makes use of two endless chains of links, fitted with cutters, combined with an adjustable bed, above and below which the chains are fitted to move in adjustable guides. A feed bed and feeding device are combined with circular saws, for carrying the material to the cutters and squaring the ends at the same time. The links of the chains are of peculiar construction, each being a plane having cutters adapted for doing the work required.

Mr. Bernard H. Hilmes, of Altamont, Ill., has patented a screw-cutting machine or implement, the dies of which are reversible and so held and operated that after the formation of the thread the bolt may be removed from between the dies without the necessity of unscrewing the bolt or turning the machine back.

An improvement in biscuit machines has been patented by Mr. Daniel M. Holmes, of Cincinnati, O. The object of this invention is to crimp the sheets of dough upon the under side or upon both sides before the sheets are cut into cakes. The invention consists in a biscuit machine with two crimping rollers placed at different levels, and in such positions that their faces can be brought into contact with each other, or nearly so, and a smooth roller placed above the upper crimping roller, so that a sheet of dough will be crimped upon both sides or upon the lower side, according as it is passed between the two crimping rollers or between the upper crimping roller and the smooth roller.

An improvement in thrashing machines has been patented by Mr. James C. Keith, of Battle Creek, Mich. The object of this invention is to prevent winding of the straw upon the thrashing cylinder when the machine is being used where the straw is long and flexible. It consists in a novel construction and arrangement of a revolving comb and stationary but adjustable comb shield combined with the thrashing cylinder, so that any straw which may be disposed to wind upon the cylinder is arrested and combed out and thrown into the separator.

In making coffeepots the lip or spout has usually been constructed separately from the body and attached thereto by means of solder. This method involves skilled labor, and is also expensive, and the attachment is in a measure insecure, besides detracting from the appearance of the vessel. Messrs. Gibson T. Ayer and Benjamin W. Taylor, of Delaware, Ky., have patented an improved coffeepot, in which the body and spout of a coffeepot are made from one piece of sheet metal without stretching, spinning, or swaging the metal for that purpose.

Messrs. S. M. Wilkes and W. H. Hyer, of Staunton, Va., have patented a bed lounge having a seat or bottom which is adapted for reversal, so that it may be conveniently and quickly adjusted with the mattress side uppermost, thus temporarily converting the lounge into a bed. The head of the bed or bottom is swiveled to a bifurcated support formed of a metal rod whose ends are pivoted in the sides of the frame of the lounge, so that by drawing the seat back from the head of the lounge it will be raised on the support, and may then be reversed.

An improved anti-chafing gear for horses and mules has been patented by Mr. Wheelock Winspear, of Mount Pisgah, Ohio. The invention consists of an endless band, of leather or other suitable substance, shaped to fit upon the shoulders and neck of the animal, beneath the collar, and held in place by attached straps that buckle to the surcingle.

An improved instrument for taking observations at sea, either at day or night, to determine the ship's position, has been patented by Mr. Charles M. Hellberg, of Jersey City, N. J. The invention consists of a frame having an arc of 180°, suitably and adjustably mounted, in combination with a day and night binocular telescope and reflecting glasses, the instrument being designed as a substitute for the ordinary sextant or quadrant.

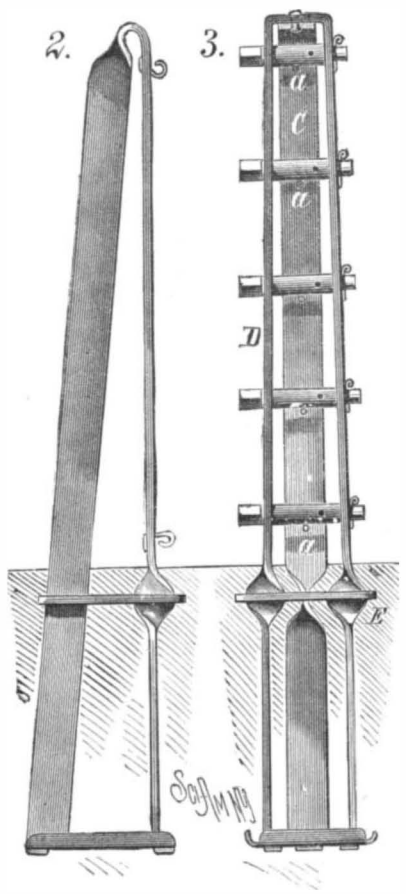
Mr. Charles J. Gustaveson, of Salt Lake City, Utah, has patented an improved spur having simple strap connection, so that a heavy strap may be employed that may be readily connected or disconnected from the foot. The improvement consists in securing a pointed hook or horn upon the end of the rim in a peculiar manner, that may be readily inserted into unslit perforations through the heavy leather.

Mr. Joseph P. Smithers, of Brooklyn, N. Y., has patented an improved electric lamp. This invention relates mainly to carbon-point lamps, but a portion of it is also applicable to incandescent lamps. The invention aims chiefly to provide an electric lamp of the former class with such regulating mechanism as will be sensitive to slight changes in the carbon points, and cause them to approach or separate, as their condition may require, by frequent but infinitesimal motions, so as to maintain the relative positions of the points uniform, and consequently render the light absolutely steady.

NEW IRON FENCE.

The fence shown in the annexed engraving is light, strong, and equally well adapted to the requirements of town or country. When used on farms the panels will generally be composed of long stretches of wire, but for gardens and city places the panels are shorter, and diagonal wires are stretched across them to render them more showy and ornamental. In a farm fence the posts may be set and then horizontal wires may be run to inclose a given area, and if after a time it is found desirable, two more horizontal wires may be added, and the fence may finally receive diagonal wires if it is found necessary or desirable. It will thus be seen that the fence may be completed by degrees, and by the extension of the system of diagonal wires the fence may be made as close as necessary for the confinement of the smaller animals.

The principal feature of the fence is the post, which is made in two forms, one for the ends or corners, another for the panel. In both of these forms the post is made with the smallest quantity of material consistent with the requirements, and the metal is so disposed as to insure great strength and rigidity



PANEL AND TERMINAL POSTS.

A glance at the engravings will give an idea of the construction of the post and the manner of setting it.

The corner post consists of two metal bars, each bent midway of their length to form the two sides of a rectangular shaft. These bars thus bent are placed together, the top of one coming beneath the top of the other, and the sides of the one partially closing the sides of the other, so that when secured together at their tops the two united form a rectangular post having corner openings through most of their height. The portion C of the post (Fig. 3) is perforated at *a* for the reception of the wires, and the part D is provided with transverse rotating tighteners having their bearings in the side bars as shown. The bars forming the posts are provided with half-twists just below the ground line of the posts, and at this point is placed a knee plate, E, which is slotted for each arm of the post. Each arm of the post is first given a quarter twist to the right, and then, by slightly compressing the lower ends of the four arms, the slotted plate may be slipped upon them and pushed up until the twists in the arms have been reached. When releasing the arms will expand and bind the knee plate, G, in place. Each arm of the post is then given another quarter turn to the right below the knee plate, which brings their faces back in line with the upper portions of the arms and securely locks the knee plate in place, thus dispensing entirely with the use of bolts or screws to secure them.

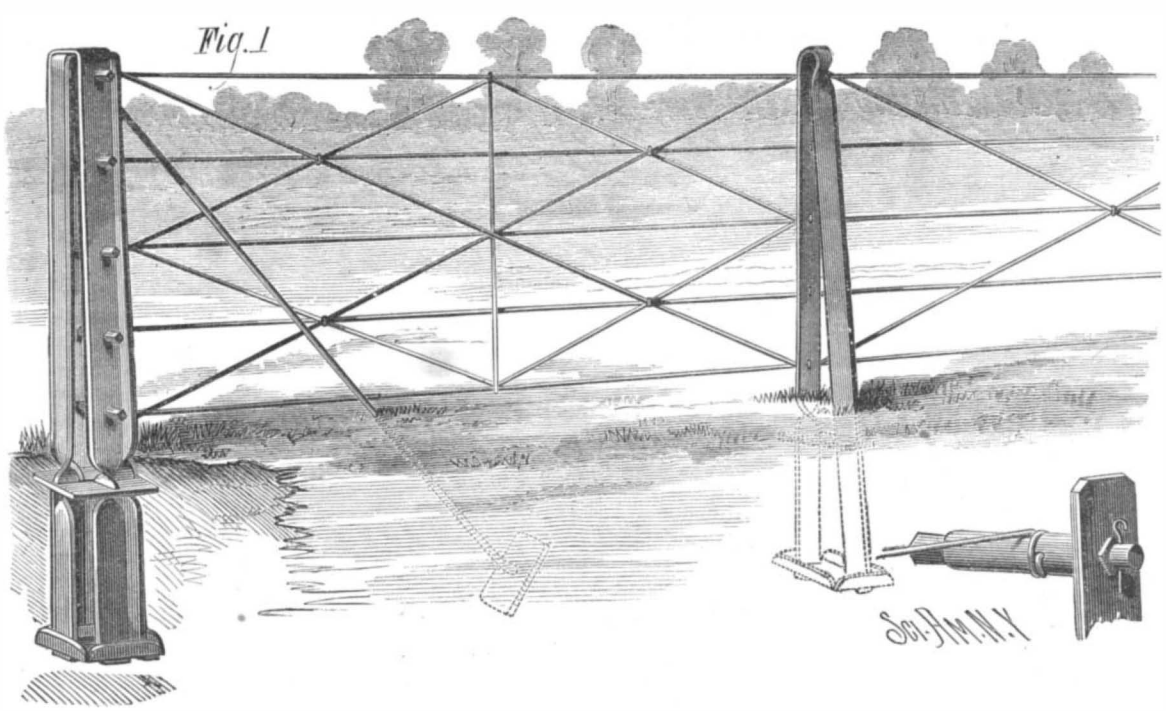
The lower ends of the arms of the post are provided with nibs, and a slotted foot plate is secured to the foot of the post by passing the nibs through the slots and clinching them on the under side.

The tighteners (shown in detail in Fig. 1) are provided at one end with a post for the wrench or key by which they are wound to tighten the wires. Near the other end of the tightener a square portion is formed, which enters a square opening in that side of the bar; and at the extreme end of each tightener is a cylindrical portion having a perforation through which a key is passed to lock the square portion in its rectangular opening in the arm of the post. When it becomes necessary to tighten the wire the key must be withdrawn and the tightener pushed inwardly from that end until the square portion leaves the rectangular opening in the post, when the tightener may be turned until the wire is sufficiently taut, when the tightener is pushed back to its normal position.

After what has been said in regard to the corner post, the construction of the panel post, shown in Fig. 2, will be readily understood.

Of course either plain or barbed wire may be stretched on the posts, and the metal ribbons, either plain or twisted, may be applied with equal facility.

This improved fence was recently patented by Mr. William C. Reicheneker, of Denver, Col. Further information may be obtained by addressing the inventor, at present at Kansas City, Mo.



REICHENEKER'S METALLIC FENCE.

Capacity of Cathedrals and Churches.

In Forbes' "Tourists" the capacity of the larger European churches and cathedrals is given as below: St. Peter's Church, Rome, holds 54,000 people; St. Paul's, London, 35,000; St. Sophia's, Constantinople, 33,000; the Florence Cathedral, 24,300; St. Petronius, Bologna, 24,000; St. Paul's, Rome, 32,000; St. John Lateran, 22,900; Notre Dame, Paris, 20,000; the Pisa Cathedral, 13,000; St. Stephen's, Vienna, 12,400; St. Dominico's, Bologna, 12,000; St. Peter's, Bologna, 11,500; the Cathedral of Vienna; 11,000; St. Mark, Venice, 7,000; the Milan Cathedral, 7,000. These figures, it will be remembered, do not refer to seating capacity.

The "Cry of Tin."

If a piece of tin be bent, it emits a sound; this, being regarded as a property peculiar to tin, has been termed the "cry of tin." This phenomenon is explained by the peculiar crystalline structure of the metal. Reasoning that if this explanation be the true one, then other metals, obviously crystalline in structure, should also exhibit the phenomenon, Mr. J. C. Douglas, who records his observations in the *Chemical News*, heated a piece of rolled zinc for a few minutes to a temperature somewhat below its melting point, when the metal became much less tough, and its fracture decidedly crystalline. On bending a piece so treated, it emitted a sound weaker than that emitted by tin, but of the same nature. Cast zinc cannot be bent readily; but if pinched between the teeth or with pliers, it emits the sound distinctly. The conclusion, therefore, is that the cry of tin is due to crystalline structure, and may be emitted by zinc and probably by other metals when crystalline in structure. The practical application is, that by the sound a metal emits "we may draw conclusions as to its texture, and hence its fitness for certain purposes, or, by the sound emitted by a beam when bent, we may draw conclusions as to its safety, the microphone or other appliance being called in to aid us where the sounds are exceedingly weak."

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The Floods of the Missouri.

The spring floods of the Missouri River were severer than usual, owing to the vast amount of snow to be melted, and the high water was made more than ordinarily disastrous by the frequent ice jams. For some weeks the local papers were filled with more or less exaggerated reports of destruction and loss of life. The hazards of life were undoubtedly many, but fortunately very few people were actually drowned. The commander of the military department embracing that region, General Terry, promptly sent Captain Claque, Commissary of Subsistence, to investigate the losses and provide for the relief of sufferers. In his report Captain Claque says that from the mouth of the Big Sioux River to Yankton, the bottom land on both sides of the river was covered with water its entire width, and looked like an inland sea, with occasional huge drifts of black ice somewhat resembling lava beds. Such sudden and merciless destruction is seldom witnessed in a lifetime. On the Dakota side alone it is estimated that about 225,000 acres of fertile land were submerged. Some idea of the destruction may be conceived when it is known that here was one of the oldest and most prosperous settlements in Dakota, said to average a family to about every 20 acres, and having a railroad transverse its length for about 50 miles, passing through six thrifty villages, now all submerged with water or entirely washed away, Elk Point Station suffering the least on account of its elevation. It may safely be said that no one living on this bottom was left free from serious loss, many having their all swept away—lands, houses, grain, and stock. On the Nebraska side the destruction was much less, as the bottom was not so thickly settled, and did not contain so much land. The most wonderful thing in this whole catastrophe is the small loss of human life.

Wool Sorters' Disease.

For some time past considerable discussion has arisen in the manufacturing districts of England over a malady called wool sorters' disease. Mr. Roberts, the medical officer of health for the district of the Keighley Local Board, treats at considerable length in his annual report for 1880 of the nature and preventives of this disease. In summing up from the report it is recommended that the following precautions be taken without fail by wool sorters: "(1) Wool sorters not to sort dangerous wools when they have any sore places or cracks on their hands or fingers; (2) to be careful not to wipe or rub their faces with their hands while sorting, especially if they have any cracks or pimples on the face or lips; (3) to wash their hands before eating, and to take neither food nor drink into the room where the wool is being sorted." The sorting room, he adds, ought to be well ventilated, to be swept regularly, and to have the walls and ceilings whitewashed twice a year.

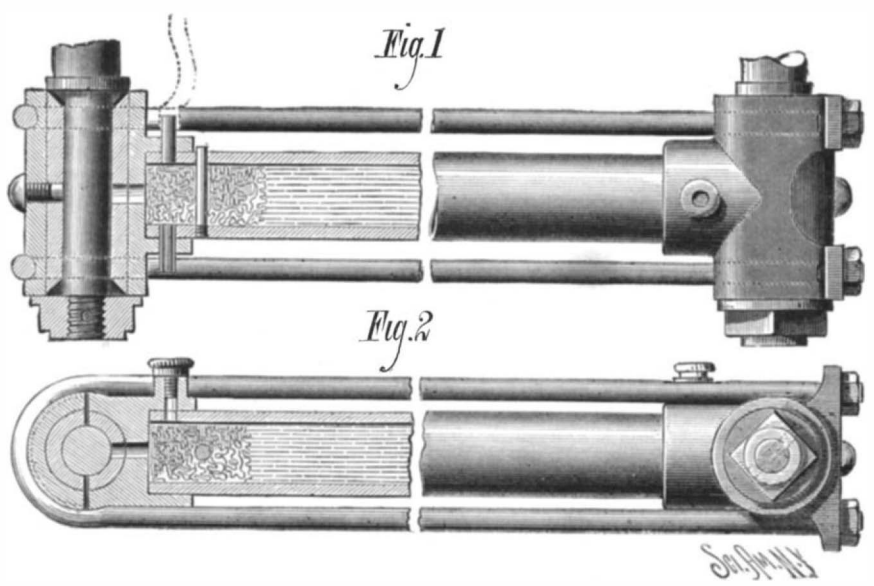
Seats for Shop Women.

The Legislature of New York has passed a bill requiring employers to provide seats for women in their employ. The absence of any seating contrivance likely to prove convenient and usable in the narrow spaces between shelves and counters is more likely to make the new law practically inoperative than any indisposition on the part of employers to deny rest to the saleswomen, for whose relief the law is chiefly intended. Why cannot some bright shop girl utilize the experience she has painfully acquired behind the counter and contrive a seat that will meet the requirements of the case? The market is ready, and the profit might be considerable.

IMPROVED CONNECTING ROD.

The engraving represents an improved connecting rod lately patented by Mr. Jacob J. Anthony, of Sharon Springs, N. Y., and designed for all varieties of machinery in which connecting rods are used. It consists of a straight tube forming an oil chamber, and having on each end a journal box communicating with the interior of the tube. The caps of the journal boxes are held in position by straps extending parallel with the tube on opposite sides of it. In each end of the tube is placed a quantity of fibrous material which acts as a strainer and prevents any impurities that may be suspended in the oil from entering the journals. The fibrous packing is held in place by a pin passing transversely through the connecting rod, and oil is introduced through a hole closed by a screw plug.

When this connecting rod is used vertically an oil cup is placed in the cap of the upper box. This rod has the advantage of being very light and yet strong and free from vibrations, while it is at the same time self-lubricating.



LUBRICATING CONNECTING ROD.

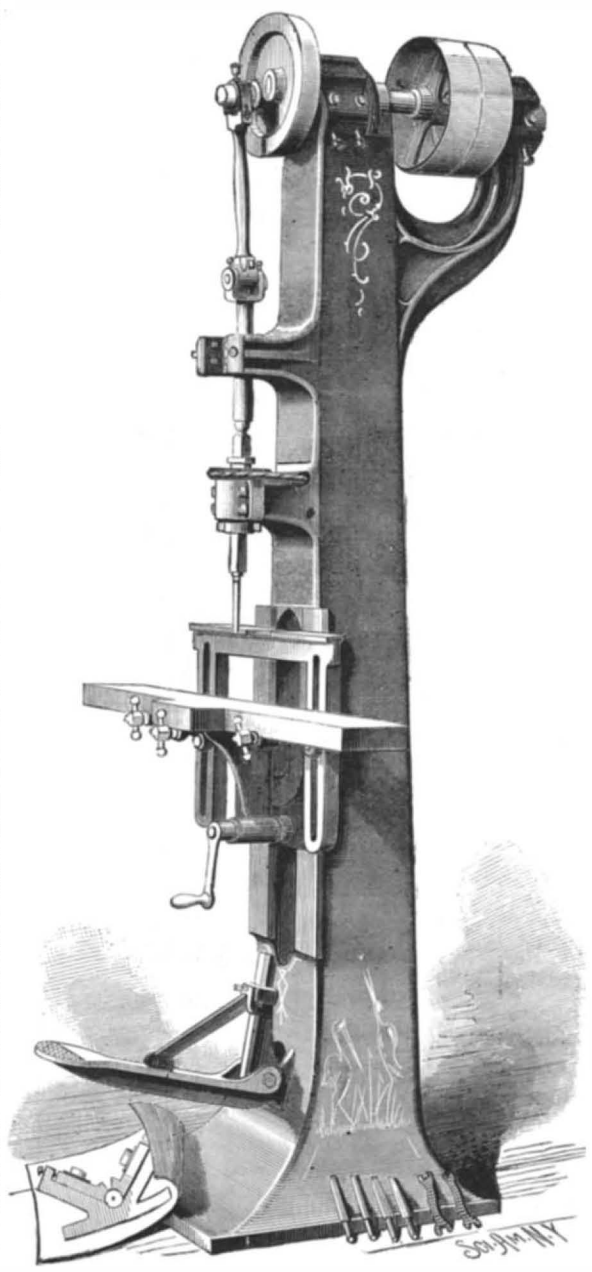
Lead Pipes Corroded by Lime.

It is a common practice with plumbers and house builders to embed lead pipes in lime mortars and cements. A writer in the London *Globe* says that when in contact with lime, lead pipes are rapidly corroded, in some cases so as to become porous and brittle within a space of fifteen or sixteen months. Obviously the careful testing of pipes in such position is in order; and if the facts are as stated, the exposure of lead pipes to lime should be carefully avoided.

NEW STYLE POWER MORTISER.

The annexed engraving shows a power mortiser for mortising doors, sash blinds, furniture, etc. The frame is cast in one solid piece, and the machine is built in the most substantial manner, and can be run at a higher rate of speed than other machines for doing the same work.

In all other mortising machines the cap of the box on crank shaft has to withstand the full effects of the blow of the chisel, thus bringing all the strain upon the caps of the box, causing a great deal of wear and lost motion. In the machine illustrated the solid iron frame is extended over the crank shaft, and the patent sliding caps—shown separately in the small detail view—are placed beneath, and the wear can be taken up by simply setting up the caps. This is an important improvement and will be readily understood. The machine also has the patent three-part box on the vertical spindle.



NEW POWER MORTISER.

The bed can be used for straight mortising in the usual manner, and is capable of being tilted to any angle for radial mortising. It is provided with the belt friction reverse known as the "Smith reverse," which reverses the chisel instantaneously, whether working or at rest. This reverse motion is acknowledged to be the best in use.

The shafts are all of the best cast steel, and the bearings are made very long. The high rate of speed at which this machine is run permits of doing a large amount of work in a given time.

The several improvements on this mortiser make it very valuable and desirable. The manufacturers of this machine call especial attention to their patent three-part sliding cap box, as shown in the detail cut. This box requires no liners, and the side as well as top wear can be taken up by setting down the governing screw.

Rowley & Hermance, the well known manufacturers of woodworking machinery, Williamsport, Pa., are makers of this machine.

Henry Chisholm.

In the death of Henry Chisholm, May 10, Cleveland, Ohio, lost a useful citizen and the iron trade one of its most deserving and capable pioneers. Mr. Chisholm was born in Scotland in 1822, and at the age of twenty emigrated to Montreal, Canada. In 1850 he removed to Cleveland to build a breakwater for the late terminus of the Cleveland and Pittsburg Railroad Company. For several years he was engaged upon the improvement of the Cleveland docks and piers. In 1857 he turned his attention to the manufacture of iron, forming the company of Chisholm, Jones & Co, setting up a rolling mill. Two years later the company which he founded set up the first blast furnace in that part of Ohio, and in the years immediately following several other furnaces and mills were established by this firm at Chicago and in Indiana.

In 1864 the firm of Stone, Chisholm & Jones organized the Cleveland Rolling Mill Company, and the year after they constructed the second Bessemer steel works in the United States. In 1871 Mr. Chisholm organized the Union Rolling Mill Company, of Chicago, and in connection with his Chicago partners erected another rolling mill at Decatur, Ill. These enterprises, the outgrowth of the original establishment in Cleveland in 1857, gave employment directly to 2,500 men. Mr. Chisholm was much esteemed by his neighbors and employes.

Arsenic Sulphide as a Poison, and its Import in Judicial Investigations.

The question was raised whether in a certain dish of cabbage containing arsenic sulphide, there was poison enough to prove fatal to a man. From a number of experiments the author concludes that arsenic sulphide, whether prepared in the moist way, or the orpiment of commerce used by painters, forms, in contact with putrescent organic matter, arsenious and small quantities of arsenic acid. In cases of poisoning with arsenic sulphide these oxidation products appear sooner or later according to circumstances. Hence, if articles of food, vomited matter, etc., are only sent for chemical examination after the interval of weeks, or perhaps months, the expert cannot give a definite answer to the question whether the poison was sufficient in quantity to prove fatal to a man.—*J. Ossikovsky.*

ENGINEERING INVENTIONS.

An improvement in that class of devices which are designed to be applied to boilers for automatic extinguishment of the boiler fires when the water in the boiler evaporates to a point below the low water line, has been patented by Antonio A. Amuedo, of Algiers, La.

Mr. Reuben Jones, of Mountville, Ga., has patented an improvement in horse powers which consists in the peculiar construction of the driving wheel, carrying an endless rope, whereby the latter is prevented from slipping on the driving wheel.

Mr. Thomas Trimble, of Albia, Iowa, has patented a removable platform and arm loop, to be used on freight cars to prevent accident to life while coupling the cars together. The invention consists in a light narrow platform removably attached to the outer end of a freight car, and a suitable loop for the brakeman's arm secured to the platform.

An improvement in dumping cars, patented by Mr. David E. Small, of York, Pa., consists in the peculiar construction of the plate for connecting the tilting body of the car to the truck, the plate being made with elevated side supports, which raise the pivotal point of the car body sufficiently high to enable it to be tilted without striking the truck too soon, and the supports have an offset at one side of its fulcrum, which catches and sustains the car body when in a horizontal position.

An improved automatic valve operator for tanks has been patented by Messrs. Alexander Jones, Charles Collins, and Hartwig A. Cohen, of New York city. The object of this invention is to provide a device for preventing the waste of liquids caused by the overflowing of tanks on account of the carelessness of the attendants or the inefficiency of the devices for indicating the exact quantity of liquid in the tank.

Mr. John F. Smith, of Erie, Pa., has patented an improved nut lock particularly adapted to bolts for connecting the ends of railroad rails, but capable of being applied to bolts

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and nuts generally; and the invention belongs to that class of nut locks wherein a ratchet block or spring stop is employed between the inner face of the nut and its contact surface, and engages with grooves upon the said inner face of the nut to admit of the free movement of the nut in one direction and prevent it from moving in the other direction.

The Yellow Pine of the South.

The average height of the yellow pine, says a southern writer, in the virgin forest is from 60 to 70 feet, with a diameter of 12 to 18 inches for two-thirds of its height. It is of slow growth, particularly at the later periods of its life. According to the number of annual rings, trees of the above dimensions must have reached an age of 60 to 70 years. The reproduction of a tree from the seed, furnishing an equal supply of timber, would at this rate take two generations. It is a poor seeder, as the younger Michaux observed. In unfruitful years, a forest of hundreds of miles may be ransacked without finding a single cone, and these, according to my observations, are far more frequent than fruitful ones. In its struggle for existence in our days, the odds of a survival of its kind among the arborescent vegetation that disputes its ground are greatly against it. Taken from the flat and moist lands, and it is replaced almost exclusively by the pond and old-field pine; the hilly, broken, dry upland, denuded of the grand old pine forest, is with surprising rapidity covered by a dense and scrubby growth of blackjack, turkey oak, scarlet, and upland willow oak, above which seldom a young pine raises its head, crowned with its large white-fringed terminal bud.

Full of resinous juices through all stages of its life, the young trees are not as able to withstand the raging fires that annually devastate the woods as the less resinous species and the deciduous-leaved trees; besides that, being of much slower growth, this noble tree is doomed to extinction if not protected by the aid of man. On tracts sheltered from the invasion of fire, groves of young trees from 15 to 25 feet high, can be observed around Mobile, testifying that its existence for the future can in some measure be secured if protected from these destructive influences, unnecessarily caused by man. The utmost efforts by an enlightened community should be made through active and efficient State legislation without further delay, to guard against the calamity of a total destruction of such a magnificent estate intrusted to the hands of our people. Besides its contributions to the manifold necessities of the agriculturist, the builder in naval architecture, the construction of railroads, the arts, medicine, and the innumerable smaller demands of domestic economy, and the varied industries of the world, the influences of this great belt upon the climatic conditions and the salubrity of the Southern coast, are even of more far-reaching importance to the interest of the community at large, extending far out of its confines. Rearing its horizontally outspreading limbs high up into the atmospheric ocean, their branches densely clothed with the long, slender leaves, the forests of these trees present to the canopy of heaven, for many hundreds of square miles, an unbroken sheet of perpetually active vegetation, whose forces at such an altitude affect a constant attraction of the fleeting clouds, causing them to deposit their life-giving and supporting humidity in grateful showers over a large area with wonderful regularity during all seasons. To this fact is due the delightful climate of this part of our country, equalizing its temperature, particularly in tempering the rigors of the long summers of a region near the tropics.

During the great progress of meteorological science of late years, the fact has been established that in this exercise upon the conditions of the atmosphere, as regards the precipitation of its moisture, the pine trees stand unrivaled among all other trees of the forest. Robbed of this protection, the hills and the plains of the Gulf region, now blooming and clothed with the richest verdure, would be arid and parched, presenting as forbidding and austere an aspect as those of the denuded coast of Africa along the Mediterranean Sea, devoid of productive power and unfit for the habitation of civilized man. The efforts of nature are ever directed to recuperation in its aims to insure the existence of different forms of the living organisms from generation to generation.

To secure to our posterity the blessings enjoyed by us in its bounty in assisting these efforts as directed by her laws, is a stern duty imposed upon us. Its discharge in the prevention of a wanton destruction of our forests and the adoption of measures regulated by the light of science, common sense, and the proper regard to the future, should engage the attention of every intelligent and patriotic citizen, appealing particularly to the owners of the soil. Of little importance to agriculture and industry are the other species of pines found in this region. Of considerably smaller dimensions than the yellow pine, and of a soft and sappy wood, they have, as timber trees, but a small value.—*N. W. Lumberman.*

ENGLISH SOFT PORCELAIN.

In England no regular hard porcelain is made, but a soft porcelain of great beauty is produced from kaolin, phosphate of lime, and calcined silex. The principal works are situated at Chelsea. The export of these English porcelains is considerable, and it is a curious fact that they are largely imported into China, where they are highly esteemed.

ENGLISH SOFT PORCELAIN VASE.

Our engraving shows a richly ornamented vase in soft porcelain from the works at Chelsea.

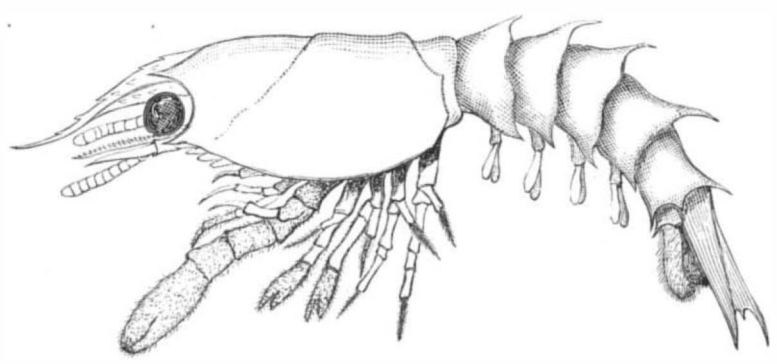
LOBSTERS.

BY A. W. ROBERTS.

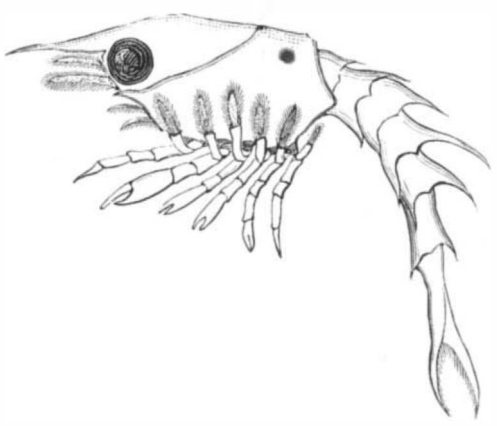
Previous to the establishment of the oil works at Hunter's Point and Greenpoint, the lobsters caught at Hell Gate were considered to be the finest that came to the New York markets. But the few caught now are so strongly impregnated with sludge, acid, and coal tar, that it is next to impossible to eat them. There is no doubt that the blastings at Hell Gate destroyed immense quantities of lobsters; so great a dread have lobsters of thunder that they will cast off their large claws when a loud clap occurs or when a gun is fired. In olden times captains of vessels often extorted blackmail from lobster fishermen by threatening to fire cannon over their fishing grounds, knowing full well that the concussion would cause the lobsters to cast their claws, thereby destroying their value. Our common lobster (*Homorous Americanus*) belongs to the order of long-tailed crustaceans (*Macroura*), which includes the crayfish, prawns, and shrimps. As an article of food the lobster is the most important of all crustaceans, and dates back to the early ages of the world. Latium was famous for its lobsters, and Athenæus, whose cook book is the oldest in the world, mentions Apicius, who spent much of his time at this place on account of its lobsters.

Fifty years ago large quantities were taken on the reef of rocks that extended from Castle Garden to Pier 4, North River, and also on the reefs off Governor's Island; now only a few are taken in the neighborhood of Fort Lafayette, our markets being supplied from Maine, Nova Scotia, and Massachusetts, the lobsters reaching here alive in "well" smacks. Large quantities are sent to New York from Boston, all ready cooked, during the winter season. On the Maine and Nova Scotia coasts thousands of girls, women, and boys, are employed in the canning of lobsters. On the first floor of these canning establishments are brick furnaces, in which are placed large copper boilers filled with sea water kept at boiling heat. As fast as the lobsters are received fresh from the fishermen they are plunged into the hot water for a few minutes, after which they are distributed on long benches covered with zinc. The women and girls then break them up and extract the solid meat from the tails and large claws, the only parts used in filling the cans, which are then placed in shallow boilers to expel the air before sealing them up, after which they are taken to the second floor to be labeled and packed in boxes capable of holding four dozen cans; these sell at four dollars per box. The number of lobsters boiled per day varies from one thousand to three thousand. The American canned lobster goes to all parts of the civilized world.

The usual way of catching lobsters is in what are known as "pots." The "lobster pot" is made of a variety of materials, laths, netting, and wicker work. On the Eastern coast nearly all the pots are made of laths, forming a long semicircular cage; at each end is a door, which lifts up when the lobster presses against it; after he has passed in the door drops back into its place, and the lobster is imprisoned, as the door cannot be raised from the inside; others have a funnel-shaped netting of rope. The pots are weighted with stones and fastened on set lines, which are buoyed at each end to mark their positions. A smart fisherman can fish one hundred and fifty pots on a single line, but it is very hard and laborious work lifting and hauling up from the deep water into the boat so many heavily weighted pots; each pot has to be rebaited and emptied of its lobsters, also cleared of all seaweed and drift. The pots are baited with what are known as "evil" fish, such as stinging rays, skate, bonkers, etc., which cost the fishermen a few cents per hundred-weight. After the lobsters are caught they are placed in large stationary cars provided with a hopper on the top, the lobsters are thrown into the hopper and pass into the car, where they remain until the "well" smack returns from New York for a fresh load. Lobsters are in season all the year round, but are the fattest from April to October. It is a mistake that any part of the lobster is poisonous; although the "lady," which is the stomach of the lobster, is very tough and indigestible, it is not poisonous. The bluish vein situated along the back and tail is to be avoided, as it often causes sickness. Lobsters are prepared for the table in many ways, the flesh is boiled, fried, pickled, scalloped, and is used for soups, salads, sauces, croquettes, pies, and pastry, but the most delicious of all is a fried "shedder" lobster. A "shedder" is a lobster who is within one or two days' time of casting its shell, which is removed artificially from the lobster before cooking. The shell of a lobster is composed of an unyielding calcareous substance, which, without doubt, is a most excellent defense for a *full grown* lobster, but it leaves no room for growth. To overcome this, all crustaceans possess the power of shedding their shells at certain seasons of the year, after which a new shell is formed; this again is cast off, and so continually until the animal has attained its full growth. Not only is the shelly coat of the body and limbs cast off, but also the following portions of the body: The foot-stalks of the eyes, external cornea of the eyes, internal thoracic bones, membrane of the ear, membranous covering of the lungs, tendons of all the claws, lining of the stomach, and the stomachic teeth. There can be but little to wonder at that a lobster often experiences great difficulty in shedding

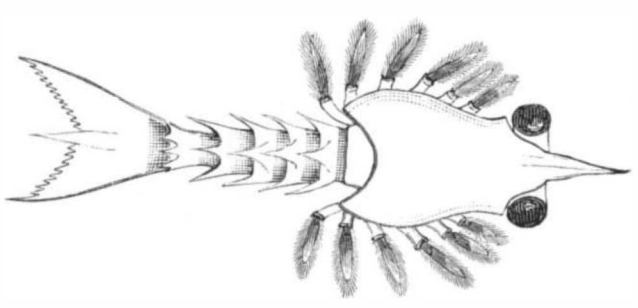


Last larval stage.

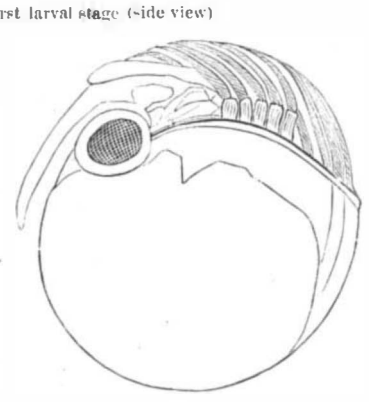


First larval stage (side view).

Cephaline thoracic leg of the second pair.



First larval stage (back view).



Embryo of lobster

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its old coat, when so many organs are involved. Sometimes the legs are torn off or badly lacerated in drawing them through the narrow joints, and when successfully accomplished the lobster is the most helpless and defenseless of all living creatures; the limbs, being soft and pliant, are incapable of offering the slightest defense. For some days previous to casting, the lobster begins to excavate a cavity under a rock; as soon as the cavity is of sufficient size he closes the entrance by pushing from the inside with his large claws a number of stones, through which enough water passes in and out for a constant supply of oxygen. He now rests for three days, refusing all food, and preparations are going on for forming a new shell. The membrane which lined the shell has become more dense, and has collected a quantity of liquid material for the consolidation of the new shell. These materials are mixed with a large quantity of coloring matter. As soon as the shell is cast off, the membrane is suddenly expanded by the pressure from within, and by the rapid growth of the soft parts the lobster soon acquires a much larger size than that of his cast-off shell. Lobsters are of a very quarrelsome disposition, and it often happens that when they fight they snap off one another's claws; in such cases the injured member is amputated to the next perfect joint, from which, in a short space of time, a new limb makes its appearance, at first very small, but constantly increasing in size. This new limb being soft and tender, all the defensive qualities of the lobster are displayed in protecting it from enemies, till next shedding time, when it comes forth a hard claw, much smaller in size than the rest, but which, in the course of several sheddings (if the lobster is young) attains its full size. It is, for this reason, a common circumstance to find a lobster with one very large claw and one small one. The amputating of the injured limb is for a very wise purpose. The blood vessels are but slightly contractile, and a wound inflicted on the most fleshy part of the claw would continue to bleed freely. By amputation at the joint the surface of the wound is reduced to a very small space, which heals quickly. A few years ago the enterprising (but not over-scientific) fishermen of the New England coast expended considerable money uselessly in constructing establishments wherein to breed lobsters. No breeding establishment in which it was necessary to have a free passage of the sea water in and out, on the rise and fall of each tide, could possibly answer for raising young lobsters, for the reason that they are so minute after leaving the egg as to be known as very interesting objects for the microscope. Again they are free swimming animals in their early stages, and what makes it still worse is that they are surface swimmers when passing through the larval stages. Most fishermen believe that after the young lobsters leave the egg they fasten on to the curiously silk-fringed appendages attached to the under side of the abdomen (erroneously called the "tail") until they are strong enough to shift for themselves. Another general belief was, that when the young lobster left the egg he was in form and color the same as the parent.

But thanks to Professor S. I. Smith, who has made a special study of the development of the lobster, there is no longer an excuse for the general ignorance on the subject that has existed. Professor Smith divides the larval condition of our native lobster into three stages. There are probably two succeeding stages before the adult form is attained. One is described by Professor Smith, while the first of the two he supposes to have existed, but has not discovered. After this the animal ceases to swim on the summer and later in the summer it seeks the bottom of the sea, where it feeds on the young of various marine animals, the larvæ of crustacea, etc. When much crowded in captivity the larvæ will feed on its own kind. In the first stage of the adult form, when the animal is about three-fifths of an inch long, it still differs from the adult so much that it would be regarded as a different genus. In this stage the young lobsters move very rapidly by means of their abdominal legs, darting backwards when disturbed by means of their abdominal appendages, and frequently jumping out of the water like shrimps, which in their movements they much resemble. They appear to live a large part of their time on the surface, and are often seen swimming about with other surface animals. Professor Smith thinks they pass through all the stages he figures in a single season. How long the young retain their free swimming habits after arriving at the lobster-like form is not known. Specimens three inches long have acquired nearly all the characters of the adult. Of all the larval stages of other genera of crustacea there are none which are closely allied to the early stages of the lobster.

In the neighborhood of Southampton, England, are several storage ponds capable of holding 50,000 lobsters in good condition for a month. Fishing (well) smacks holding 10,000 lobsters each collect the lobsters off the coasts of Scotland, Ireland, and France for the storage ponds. In the reign of George II. a close season was established in Scotland, extending from June 1 to September 1. There still exists a fine of five pounds for taking lobsters during the close season, but its not having been enforced of late years the number of lobsters has gradually decreased. The quantity of lobsters taken on the Irish coast is less now than 20,000 per annum A law exists in England regulating the length of salable lobsters to eight inches, and the penalty of exposing them for sale under eight inches is confiscation.

The number of lobsters shipped from the coast of Norway to London amounts to over a million a year, for which the sum of $100,000 is paid. The English lobster companies have agents along the entire coast of Norway to buy up all the lobsters caught, which bring at Billingsgate from 18s. to 20s. per dozen. The number of lobsters sold in England has averaged 3,000,000 per annum.

In the State of Rhode Island lobster fishermen are prohibited by law to "lift" their lobster pots from Friday night to Monday morning.

In the State of Maine there exists a close season which covers the period of time in which the female is carrying her eggs and the release of the larvæ from the egg.

The law of New York State, which is based on that of Massachusetts, has been mailed to every lobster fisherman in New York State by the fish dealers of New York city:

DEAR SIR: The Legislature of the State of New York has passed a law, which has been signed by the Governor, prohibiting the sale of small lobsters, as follows:

AN ACT PROVIDING FOR THE PRESERVATION OF LOBSTERS.

Be it enacted in Legislature assembled, and by authority of the same as follows:

SEC. 1.—Whoever sells or offers for sale, or has in his or her possession, with intent to sell, either directly or indirectly, any lobsters less than ten and one-half inches (10½) in length, measurement to be taken from one extremity of the body to the other, exclusive of claws or feelers, shall for every such lobster be fined to an amount not less than five dollars ($5), and in all prosecutions under this act the possession of any lobster not of the length hereinbefore required, shall be *prima facie* evidence to convict.

SEC. 2.—All forfeitures accruing under the act shall be paid one-half to the person making the complaint and one-half to the city or town where the offense is committed.

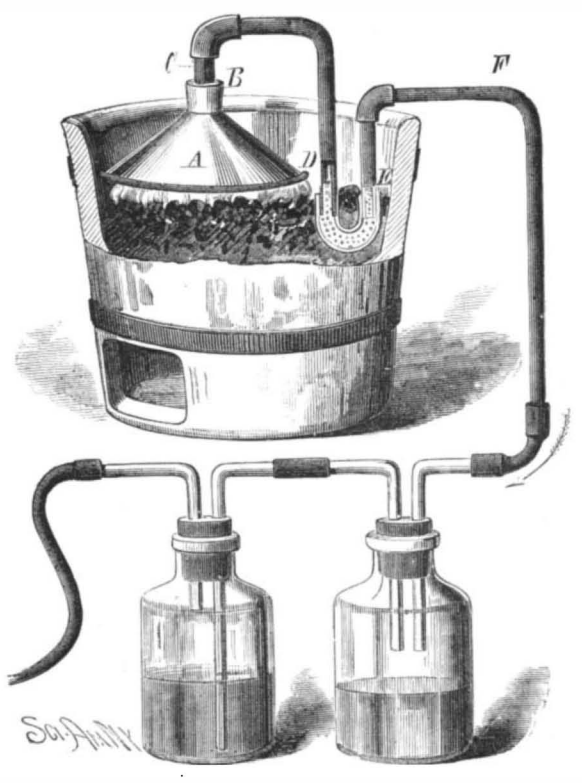
SEC. 3.—This act shall take effect on the first day of June, 1880.

You will therefore please see that there are none of less size than allowed by law—10½ inches in length—in any of your shipments to us.

To show how prolific lobsters are, it is stated that no less than 12,000 eggs were counted in a single female. The eggs are carried by the female under the abdomen, and are fastened and entangled to the silk-fringed appendages previously mentioned. As the outer layers of eggs become ripe the mother constantly stirs them with her small hind claws, either to clear them of sediment or parasites or else to aid the larvæ in breaking through the shell. The "coral" formed in cooked lobster is the roe or egg masses of the female lobster. As to the sight of the lobster it may well be good, for he is possessed of compound eyes like those of insects, only the lenses are square instead of hexagonal. The lobster often freaks both in colors and the form of the large claws. When in charge of the Aquarium I had several specimens of deep blue and a beautiful light blue lobsters, also three of a bright crimson, and many with double large claws.

OXYGEN FROM BLEACHING POWDER.

Hitherto oxygen when required in anything like a pure or undiluted state—as for the lime light, oxyhydrogen blowpipe, etc.—has been obtained almost exclusively from potassium chlorate by heating that salt to decomposition in the presence of peroxide of manganese.



APPARATUS FOR MAKING OXYGEN GAS FROM BLEACHING POWDER.

Pure potassium yields nearly one-third its weight of oxygen. The commercial is never chemically pure, however, and in practice it rarely yields more than twenty-three gallons a pound (at 60° Fah. and normal pressure) of gas, the latter frequently containing much chlorine.

The salt costs at wholesale twenty-five cents a pound, and requires to be mixed with about one-quarter its weight of peroxide of manganese, costing eight cents a pound, thus making the cost of the gas for materials alone about nine cents a cubic foot.

Where economy is considered, common bleaching powder or chlorinated lime can be made to profitably take the place of the more expensive salt as a source of oxygen.

An average sample of bleaching powder (fresh) contains at least twenty-six per cent of calcium hypochlorite. This substance when heated to the boiling point of water splits up into calcium chloride and calcium chlorate. If the heat is increased to low redness the chlorate is decomposed into calcium chloride and oxygen.

During the elevation of temperature some hypochlorous acid is apt to pass off; but if the apparatus is so arranged that the gas is forced to pass over or through a small quantity of heated lime it is arrested, decomposed, and the oxygen liberated—oxygen and steam only passing over.

In a series of late experiments with an apparatus similar to that described below, the yield in oxygen per pound of common commercial bleaching powder, costing one and three-quarter cents, averaged four gallons, making the cost of materials for oxygen from this source about three and one-quarter cents per cubic foot, as compared with nine cents where potassium chlorate is used.

The gas after passing through the wash bottles is perfectly odorless and nearly pure.

Where the gas is required in small quantities, a few cubic feet at a time, the following simple and inexpensive apparatus answers very well:

The retort, A, is made of common sheet iron, doubly lapped and riveted. The short neck, B, is slightly flaring so as to admit of the luting in of a piece of inch steam pipe. This pipe, C, is connected by a screw cap or elbow with a longer piece of similar pipe bent somewhat and extending downward two or three inches below the bottom of the retort, where it is joined by a U cap at its lower end with a third piece of iron pipe extending upward above the bottom line of the retort. A fourth piece of pipe is connected with this latter at right angles for convenience of attachment to condenser and wash bottle. The space from D to E in the tube is loosely filled with fragments of quicklime, each somewhat larger than a pea.

Two or three pounds of the chlorinated lime having been put into the retort, the pipe, B, is loosely inserted in the neck and the joint made tight with a stiff luting of clay or plaster of Paris. The retort is then placed on a charcoal or other moderate fire, the portion of the pipe containing the lime being in the fire. Connection is made with the condenser and wash bottle as soon as steam begins to come over, and as soon as the air in the apparatus has been displaced connection is made by rubber tubing with the gas bag or reservoir.

The moisture in the heated substance first passes off together with some gaseous matter, the latter being decomposed by the lime; then as the temperature rises and approaches low redness oxygen is rapidly disengaged, and if the fire is good ten minutes' heating will suffice to exhaust the charge.

The stop cock at bag or reservoir having been closed the retort may be slipped out, another similar one already charged put in its place, and the operation repeated if desired.

The chloride of lime should not be too moist when placed in the retort, or the charge greater than will loosely cover the bottom of the vessel to a depth of one and one-half inches.

If a sudden pressure greater than the delivery pipe can relieve is developed in the retort the luted joint acts as a safety valve.

The sheet iron retorts do not, of course, last very long under such treatment. If the pipes are well washed on the inside with a thin paste of ocher and water and allowed to dry the gas and vapors passed through will not affect them much after the first charge.

The lime in the tubes is usually sufficient for two or three charges. It is better to renew it frequently, as it is gradually converted into calcium chloride, which melts on heating and when cooled requires to be washed out.

On a larger scale retorts similar in form to those used in making coal gas may be advantageously employed, the large delivery tube, partly filled with fragments of quicklime, being arranged so as to pass over the fire and be kept at a low red heat.

The Crater of Popocatapetl.

In a letter to the Philadelphia *Record*, Mr. Nathan E. Perkins, of Merchantville, N. J., describes at great length an ascent of the Mexican volcano Popocatapetl, having reached the crater after a toilsome climb and descended as far as he could without a rope. From this position a good view was obtained of the crater walls; the bottom was hidden by ascending smoke and steam. The lower walls were hung with large masses of sulphur interspersed with icicles hundreds of feet long.

"The crater is about one mile across, and has the appearance of a large funnel whose sides are but little inclined, and the bottom not visible. There seem to be three distinct rings, which divide it into four zones, the largest being that nearest the mouth. From the summit, the City of Mexico, although over 100 miles away, was plainly visible, and, surrounded by lakes, as it is, seemed like a magnificent gem set around with pearls. The whole great Valley of Mexico can be seen at a glance. At our feet lay Ameca, over 30 miles distant, with its luxurious growth of tropical plants and orange groves and banana plantations, and on the right Puebla and the old cities of Chilulo and Tascalla, with their 365 churches and spires. The distant mountain of Orizaba, nearly 200 miles away, the snowy peaks of Melencha, the White Lady, and several others in the distance, stood arrayed before me. I felt fully repaid for my toil in having climbed the highest mountain in North America, whose summit is about 18,000 feet above the sea level.'

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AGRICULTURAL INVENTIONS.

Mr. William D. Ferguson, of Blue Mound, Ill., has patented an improvement in check-row corn planters of that class in which the seed-dropping slide receives motion from a rope stretched across the field, so constructed that they can be operated to drop the seed at uniform distances apart by means of a smooth rope.

Mr. Solomon P. Baughman, of Herring, O., has patented a simple device for regulating the depth of the furrow made by the plow. It consists of a clevis whose inclination is adjusted by a jointed screw on the plow beam.

A combined plant setter and fertilizer distributer has been patented by Mary I. Goldsmith, of The Plains, Va. The object of this invention is to facilitate the operation of setting tobacco and other plants, and applying fertilizers thereto.

Mr. John W. Witt, of Grenola, Kan., has patented attachments for connecting plows to sulkies which are so constructed as to be used with a right-hand plow and a left-hand plow, and which will allow the plow to work with entire freedom and to be raised and lowered as circumstances may require.

Mr. Henry Parker, of Gananoque, Ontario, Canada, has patented an improved potato digger so constructed as to raise the potatoes and soil from the ground, separate them, and deposit the potatoes upon the top of the ground at the side of the digger.

Mr. Lovell A. Richards, of Grayson, Cal., has patented an improved feeder for thrashing machines, so constructed as to feed the stalks of grain to the thrashing cylinder regularly and continuously, and to prevent the machine from being choked or jarred by irregular feeding.

Mr. Julius Hartmann, of New York city, has patented an improved reversible plow which is constructed so that it can be reversed at the end of the furrow, can be adjusted in height as may be necessary, and is provided with a carriage that can be adjusted in width to suit the furrows.

In potato diggers as commonly constructed scoops and vibrating screens have been used, but they have generally been only partially successful in separating the potatoes from the dirt, in consequence of the great accumulation upon the apron, which not only hinders the separation, but adds to the weight and draught of the machine. Mr. Henry Arnold, of Peru, N. Y., has patented a potato digger in which any accumulation of soil upon the screen or apron is prevented by commencing the separation at the moment the potatoes and dirt are taken up.

The Pressure of Wind.

In a paper before the American Society of Civil Engineers, Mr. C. Shaler Smith gives the results of many years' observations of wind pressure and its effects. He has personally visited the tracks of destructive storms as soon as possible after their occurrence, for the purpose of determining the maximum force and the width of the path of the storm in every instance. The most violent storm in Mr. Smith's records was at East St. Louis, in 1871, when the wind overturned a locomotive, the maximum force developed in so doing being no less than 93 lb. per square foot. At St. Charles, in 1877, a jail was destroyed, the wind force required being 84·3 lb. per square foot. At Marshfield (Mo.), in 1880, a brick mansion was leveled, the force required being 58 lb. per square foot. Below these extraordinary pressures there were sundry cases of trains blown off rails, and bridges, etc., blown down by gales of wind of from 24 lb. to 31 lb. per square foot. Mr. Smith observes that in all his examples he has taken the minimum force required to do the observed damage, and has considered this as the maximum force of the wind, although, of course, it may have been much higher. Some of the hurricanes were very destructive, the one at Marshfield having cut down everything along a path 46 miles long and 1,800 feet wide, killing 250 people. Mr. Smith has formed the conclusion that notwithstanding these examples, 30 lb. per square foot is sufficient wind pressure to allow for in a working specification. As reasons for this conclusion, Mr. Smith expresses doubts as to whether a direct wind or gale ever exceeds this pressure. Whirlwinds may exceed it, but the width of the pathway of maximum effort in these is usually very narrow. Mr. Smith has only found one example, already quoted, wherein the path of pressures over 30 lb. per square foot exceeded 60 feet wide. This pressure is in itself very unusual, and, referring more particularly to railway bridges, it is stated that a loaded passenger train will leave the rails at this pressure of wind, and consequently not much could be gained by making the bridge strong enough to resist a storm which would blow a train off it.

Clocks in the Earthquake.

The most curious circumstance connected with yesterday morning's earthquake was the stoppage of all of the pendulum clocks hanging against eastern walls, showing that the vibration was north and south. Clocks hanging against other walls were not affected. In the jewelry store of Charles Haas there is a calendar clock, which on Saturday night was about five hours fast. It was impossible to put the hands back without disarranging the gearing, and the only way in which it could be regulated was to turn the hands forward until they marked the right time. As this process required about 15 minutes, and was exceedingly tedious, Mr. Haas, when he left at 9 o'clock, stopped the pendulum, intending to regulate the clock on the following day. The earthquake saved him the trouble. When he came to his store yesterday morning the timepiece was ticking away like a pawnbroker, and what is still more remarkable, it was correct to a second. The town clock is propelled by a pulley and tackle, and consequently such a mild convulsion as that of yesterday morning did not disturb the serenity of its equanimity. The final cataclysm will probably set the old Janus-faced chronometer back a few moments, but earthquakes never will. No material damage was effected by the trembler, as far as we can learn, except the shattering of a few nerves and the loss of sleep attendant upon the excitement. The plastering of ceilings in several houses was badly cracked, crockery thrown from shelves, chimneys toppled from lamps, besides numberless unimportant occurrences of a similar character. At the jail, Officer Fields thought, upon awakening from a sound sleep, that the prisoners were trying to break out. The prisoners thought somebody was trying to break in.—*Stockton (Cal.) Independent, April* 11.

Explosion of Gas on Coal Ships.

There can scarcely be a doubt that many of the coal-laden vessels that annually leave our ports and are no more heard of are destroyed by explosions of gas. Therefore the caution which lately emanated from the Marine Department of the Board of Trade, and which appeared in our columns, pointed out the necessary measures that should be taken for preventing explosions of coal gas, as recommended by the Royal Commission appointed to inquire into the spontaneous combustion of coal in ships, should not pass unnoticed as such warnings usually do. But there are other considerations in connection with coal cargoes that shippers and captains should be acquainted with. There are some descriptions of coal that give off a great deal more gas than others, and consequently require more attention on a voyage. Soft, bituminous coal on its transmission from the colliery to a port, and then thrown down the hold of a vessel, is much broken, and getting to something nearly akin to slack, gives off the gas freely, while such would not be the case were the coal hard and in large lumps. Some vessels having cargoes of soft coal are more dangerous than a colliery, for, while the latter is ventilated by copious volumes of fresh air being sent to dilute the gases, the coal on board a ship is kept from the air, the hatches being fastened down as if they were for that express purpose. After being kept in that state it may be for weeks, something is required, the hatches are taken off, and the object is sought for with a light, at which the gas at once fires, dealing destruction around, so that not a vestige of the vessel may be left to tell of the catastrophe. There is also the spontaneous combustion of coal to guard against, and in respect to which we believe not much attention is paid, while some descriptions are liable to take heat and fire the same as is the case with hay-stacks at times.

One of the means recommended by the commission for ascertaining the state of a hold of a vessel having a heavy tonnage of coal was the use of the thermometer, so as to ascertain the temperature. For our part we think that the hatches should be frequently removed, and some means adopted for having communication with the coal lying at the top and intermediately to the bottom, so that the gas could find its way to the atmosphere, which it would do if it had the means and was not confined. But where the gas is pent up, especially as is the case where the coal is small, it only requires the means of escape and a naked light to lead to a conflagration that would soon destroy a vessel and everything connected with it. Ventilation is not more necessary in a mine than on board a coal-laden ship, so far as the cargo is concerned, and this should be strictly laid down by rules on the part of owners, for the danger resulting from the gas in coal, either from explosions or spontaneous combustion, are either not sufficiently known or sufficiently guarded against.—*Colliery Guardian.*

Testing Malts for Acidity.

At the risk of being charged with repeating in this column what has already been several times urged, we again draw the attention of brewers to this subject. The existence of abnormal acidity in malt is not only injurious in itself, but this very excess of acidity undoubtedly hastens changes in the resulting wort and beer, which tend to their ultimate destruction as drinkable fluids. From the commencement of the malting season till the warmer weather of spring sets in, the development of acidity in malts proceeds but slowly, but after April, and especially in malts which have been stored for some time, the amount of acidity will be found to have increased. To determine with accuracy the absolute quantity of acid in a sample of malt is an operation attended with some difficulty, and requires the skill and appliances of a practical chemist; but a valuable comparative test for acidity can be made by any brewer with but few appliances, and with but little knowledge of chemical manipulation. We say comparative test in contradistinction to an absolute test, because the former will really give the brewer all the information he requires; he wants to compare one malt with another, and he is generally able to fix his own standard of excellence. Therefore in testing malts for acidity (and the remark applies equally to other qualities) all that is necessary for the brewer to do is to submit them all to precisely the same treatment. Two infusions of the malt are prepared, one with cold water and the other at the average mashing temperature, say 160° Fah.; all samples to be tested must be treated in exactly the same manner as regards quantities, time, and temperature, and they are then passed through a filter paper, and the acidity determined in each by means of a standard alkaline solution, using delicate litmus papers as the indicator. It is not well to operate upon too small a quantity, and in practice 1,000 grammes to a liter of water will be found convenient. Every sample of malt must be crushed to the same state of fineness, and for this purpose an ordinary coffee mill answers admirably. The water used in making the infusions should be pure distilled water, unless a water of very constant composition, such as is supplied to London, is at hand.

The standard alkaline solution is best made with ammonia, and can be of any desired strength, but of course very dilute; it may be titrated so that every cubic centimeter corresponds to 0·01 per cent of lactic acid, but any other strength will do equally well, as the tests we suggest are only for the purpose of comparing samples of malt one with another. The acidity of the cold infusion gives the actual amount of acid existing in the malt, but that of the hot infusion gives, in addition, the amount of acid developed during the mashing process. From the experience derived in the examination of many hundred samples of malt, we are able to assert that the presence of an excessive amount of acidity in the hot infusion is an almost sure sign of unsoundness in the malt. The difference in the acidities of the cold and hot infusions ought never to exceed one-fourth of the acidity of the cold infusion; thus, supposing a malt gives a cold infusion requiring 20 cubic centimeters of the standard solution to exactly neutralize it, the hot infusion ought not to require more than 25 c. c. This method of comparative testing may also be extended to the color and gravity of the resulting worts, and much useful information as to the quality of the malt can thus be obtained.—*Brewers' Guardian.*

Overworking the Undeveloped Brain.

"Overwork," properly so-called, can only occur when the organ upon which the stress of the labor falls is as yet immature, and, therefore, in process of development. When an organ has reached the maturity of its growth it can only work up to the level of its capacity or faculty for work! Fatigue may produce exhaustion, but that exhaustion will come soon enough to save the organ. Repeated "efforts" may, under abnormal conditions, follow each other too rapidly to allow of recuperation in the intervals of actual exertion, and as the starting point will, in each successive instance, be lower than the previous state, there may be a gradual abasement; but even this process should not seriously injure a healthy and well developed organ. In short, a great deal of nonsense has been said and written about the "overwork" of *mature* brains, and there are grounds for believing that an excuse has been sought for idleness, or indulgence in a valetudinarian habit, in the popular outcry on this subject which awhile ago attracted much attention. Nevertheless there can be no room to question the extreme peril of "overwork" to growing children and youths with *undeveloped* brains.

The excessive use of an immature organ arrests its development by diverting the energy which should be appropriated to its growth, and consuming it in work. What happens to horses which are allowed to run races too early happens to boys and girls who are overworked at school. The competitive system as applied to youths has produced a most ruinous effect on the mental constitution which this generation has to hand down to the next, and particularly the next-but-one ensuing. School work should be purely and exclusively directed to development. "Cramming" the young for examination purposes [college students at this time of year take heed.—ED.] is like compelling an infant in arms to sit up before the muscles of its back are strong enough to support it in the upright position, or to sustain the weight of its body on its legs by standing while as yet the limbs are unable to bear the burden imposed on them. A crooked spine or weak or contorted legs is the inevitable penalty of such folly. Another blunder is committed when one of the organs of the body—to wit, the brain—is worked at the expense of other parts of the organism, in face of the fact that the measure of general health is proportioned to the integrity of development, and the functional activity of the body as a whole in the harmony of its component systems. No one organ can be developed at the expense of the rest without a corresponding weakening of the whole.—*Lancet.*

Vanadium Ink.

Berzelius found that by treating an infusion of galls by a solution of vanadate of ammonia, in place of sulphate of iron, he could produce an ink of remarkably good quality. At the time of his discovery, in 1831, it was of no practical interest, because the vanadates were very costly. At the present time their cost has been so much reduced that his recipe can be employed for ordinary inks, which have the additional advantage of presenting great resistance to most reagents and destructive materials. Gum arabic can be dispensed with, and the chance of moulding or alteration thus reduced.—*Chron. Industr.*

To Harden Finishing Varnish.

A newly varnished carriage is liable to spot. To prevent this, some wash the carriage two or three times in clean cold water, applied with a sponge instead of using a hose; this will help harden the surface, and prevent it, to some extent, from being injured by the mud or water getting splashed on the job. Never let mud dry on the surface, and then wash off expecting to see no spots on the varnish. You will certainly be disappointed, and the only way to remedy the evil will be to have it revarnished. Soft water is better than hard water for the washing of carriages, as the lime which is in the hard water is very liable to injure the varnish.

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Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

The splendid Patent Hot Air Bath illustrated in this paper May 14, page 310, is offered very low.

Combination Roll and Rubber Co., 27 Barclay St., N. Y. Wringer Rolls and Moulded Goods Specialties.

It drives disease away, is what every one says of Van Bell's "Rye and Rock."

Ladies can save the annoyance and expense of visiting a chiropodist by using German Corn Remover. 25 cents.

Sewing Machines and Gun Machinery in Variety. The Pratt & Whitney Co., Hartford, Conn.

Wanted.—A responsible business man would be pleased to represent a manufacturing company in Salt Lake City. Centrally located for Utah, Idaho, and Montana. Address J. P., Box 755, Salt Lake City, Utah.

Houghton's Boiler Compound contains nothing that can injure the iron, but it will remove scale and prevent its formation. Houghton & Co., 15 Hudson St., N. Y.

To Business Men.—An intelligent young man, of some business experience, would like a situation. Anything honorable. Unquestionable reference. Box 985, Providence, R. I.

Wanted.—An old established machinery firm on Cortland street would be pleased to represent, in New York city, a firm or company manufacturing a variety of Engines, Boilers, etc. Address Engine, Box 773, New York.

Why risk boiler explosion from mud? It can be avoided, at nominal cost, by Hotchkiss' Mechanical Boiler Cleaner, 84 John t., N. Y. Engineers make ten per cent selling other parties than employers. Send for circular.

Lead Mine for Sale.—Undeveloped, but believed to be very rich. Short distance from St. Louis, Mo. Undivided half interest for sale to some one who will develop it. A fortune quickly made. Full particulars furnished only to those who have a few thousand dollars cash. Address W. W. Davenport, Oregon, Holt Co., Mo.

Genuine German Corn Remover; not a salve, ointment, or plaster. It eradicates the corn by four applications.

Use the Vacuum Oils. The best car, lubricating, engine, and cylinder oils made. Address Vacuum Oil Co., No. 3 Rochester Savings Bank, Rochester, N. Y.

Wiley & Russell M'f'g Co. See adv., p. 333.

Tarred Roofing and Sheathing Felts. A. Wiskeman, Paterson, N. J.

Portable Railway Track and Cars. Contractors, Planters, Miners, send for circulars. Francis W. Corey & Co., 5 & 7 Dey St., New York; 59 & 61 Lake St., Chicago, Ill.

Punching Presses & Shears for Metal-workers, Power Drill Presses. $25 upward. Power & Foot Lathes. Low Prices. Peerless Punch & Shear Co., 115 S. Liberty St., N. Y.

Books on Practical Science. Catalogues free. Pocket Book of Alphabets, 20 cts. Workshop Receipts; a reliable handbook for manufacturers. $2, mail free. E. & F. N. Spon, 446 Broome St., N. Y.

Essay on Inventions.—What qualities will make them profitable, and how to incorporate these qualities in inventions. 25 cts. postpaid. Address N. Davenport, Valparaiso, Ind.

Improved Skinner Portable Engines. Erie, Pa.

"Rival" Steam Pumps for Hot or Cold Water; $32 and upward. The John H. McGowan Co., Cincinnati, O.

The Eureka Mower cuts a six foot swath easier than a side cut mower cuts four feet, and leaves the cut grass standing light and loose, curing in half the time. Send for circular. Eureka Mower Company, Towanda, Pa.

The Newell Universal Mill Co., Office 34 Cortlandt St., New York, are manufacturers of the Newell Universal Grinder for crushing ores and grinding phosphates, bone, plaster, dyewoods, and all gummy and sticky substances. Circulars and prices forwarded upon request.

Pure Oak Leather Belting. C. W. Arny & Son, Manufacturers, Philadelphia. Correspondence solicited.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J.

Wood-Working Machinery of Improved Design and Workmanship. Cordesman, Egan & Co., Cincinnati, O.

Experts in Patent Causes and Mechanical Counsel. Park Benjamin & Bro., 50 Astor House, New York.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

Malleable and Gray Iron Castings, all descriptions, by Erie Malleable Iron Company, limited, Erie, Pa.

National Steel Tube Cleaner for boiler tubes. Adjustable, durable. Chalmers-Spence Co., 10 Cortlandt St., N. Y.

Corrugated Wrought Iron for Tires on Traction Engines, etc. Sole mfrs., H. Lloyd, Son & Co., Pittsb'g, Pa.

Best Oak Tanned Leather Belting. Wm. F. Forepaugh, Jr., & Bros., 531 Jefferson St., Philadelphia, Pa.

Stave, Barrel, Keg, and Hogshead Machinery a specialty, by E. & B. Holmes, Buffalo, N. Y.

Wright's Patent Steam Engine, with automatic cut off. The best engine made. For prices, address William Wright, Manufacturer, Newburgh, N. Y.

Nickel Plating.—Sole manufacturers cast nickel anodes, pure nickel salts. Importers Vienna lime, crocus, etc. Condit. Hanson & Van Winkle, Newark, N. J., and 92 and 94 Liberty St., New York.

Presses, Dies, Tools for working Sheet Metals, etc. Fruit and other Can Tools. E. W. Bliss, Brooklyn, N. Y.

Cope & Maxwell M'f'g Co.'s Pump adv., page 332.

The I. B. Davis Patent Feed Pump. See adv., p 332.

Moulding Machines for Foundry Use. 33 per cent saved in labor. See adv. of Reynolds & Co., page 334.

Machine Knives for Wood-working Machinery, Book Binders, and Paper Mills. Also manufacturers of Soloman's Parallel Vise, Taylor. Stiles & Co., Riegelsville, N. J.

Skinner's Chuck. Universal, and Eccentric. See p. 333.

Blake "Lion and Eagle" Imp'd Crusher. See p. 350.

Gardiner's Pat. Belt Clamp. See illus. adv., p. 349.

For best Duplex Injector, see Jenks' adv., p. 349.

C. B. Rogers & Co., Norwich, Conn., Wood Working Machinery of every kind. See adv., page 349.

Eclipse Fan Blower and Exhauster. See adv., p. 348.

The Sweetland Chuck. See illus. adv., p. 349.

4 to 40 H. P. Steam Engines. See adv. p. 349.

For Sale.—13 x 30 and 16 x 48 inch Horizontal Engines, complete and in good order. Prices, $700 and $950 respectively. 25, 35, and 80 H. P. Locomotive Boilers, $425, $500, and $925. Extra No. 1, 22½ inch, 8 roll, 4 side (Schenck) Planer and Matcher, in perfect order, $1,200. 70 feet 3½ inch Shafting, with Hangers, Pulleys, and Couplings, 5 cts. Belcher & Bagnall, 40 Cortland St.

Peck's Patent Drop Press. See adv., page 366.

Fire Brick, Tile, and Clay Retorts, all shapes. Borgner & O'Brien, M'f'rs, 23d St., above Race, Phila., Pa.

Silica Paints (not mixed); all shades. 40 Bleecker St., N. Y.

Turbine Wheels; Mill Mach'y. O. J. Bollinger, York, Pa.

For best Portable Forges and Blacksmiths' Hand Blowers, address Buffalo Forge Co., Buffalo, N. Y.

The Brown Automatic Cut-off Engine; unexcelled for workmanship, economy, and durability. Write for information. C. H. Brown & Co., Fitchburg, Mass.

The None-such Turbine. See adv., p. 350.

Brass & Copper in sheets, wire & blanks. See ad. p. 365.

The Chester Steel Castings Co., office 407 Library St., Philadelphia, Pa., can prove by 15,000 Crank Shafts, and 10,000 Gear Wheels, now in use, the superiority of their Castings over all others. Circular and price list free.

Wren's Patent Grate Bar. See adv. page 365.

Diamond Engineer, J. Dickinson, 64 Nassau St., N. Y.

The Improved Hydraulic Jacks, Punches, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

Eagle Anvils, 10 cents per pound. Fully warranted.

Geiser's Patent Grain Thrasher, Peerless, Portable, and Traction Engine. Geiser M'f'g Co., Waynesboro, Pa.

Houston's Four-Sided Moulder. See adv., page 364.

Long & Allstatter Co.'s Power Punch. See adv., p. 365.

For Mill Mach'y & Mill Furnishing, see illus. adv. p. 364.

For Mining Mach'y, see ad. of Noble & Hall, p. 366.

New Economizer Portable Engine. See illus. adv. p. 365.

Rue's New "Little Giant" Injector is much praised for its capacity, reliability, and long use without repairs. Rue Manufacturing Co., Philadelphia, Pa.

Saw Mill Machinery. Stearns Mfg. Co. See p. 364.

Saunders' Pipe Cutting Threading Mach. See p. 366.

For Shafts, Pulleys, or Hangers, call and see stock kept at 79 Liberty St., N. Y. Wm. Sellers & Co.

Wm. Sellers & Co., Phila., have introduced a new injector, worked by a single motion of a lever.

For Sequeira Water Meter, see adv. on page 364.

Toope's Pat. Felt and Asbestos Non-conducting Removable Covering for Hot or Cold Surfaces; Toope's Pat. Grate Bar. C. Toope & Co., M'f'g Agt., 353 E. 78th St., N. Y.

Use Vacuum Oil Co.'s Cylinder Oil, Rochester, N. Y.

Don't buy a Steam Pump until you have written Valley Machine Co., Easthampton, Mass.

For Machinists' Tools, see Whitcomb's adv., p. 364.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

(1) A. A. R. asks if either gun or powder is injured by leaving the gun loaded, the gun being the ordinary iron barrel. A. If the gun is not perfectly clean (freed from the remains of burnt powder) and well oiled it is not well to leave the charge in any length of time. 2. I want a simple test for cistern water to tell whether or not there is sewer poison in it. A. Dissolve in a pint of distilled water half an ounce of pure tannic acid and filter the solution through filter paper into a clean bottle. Dissolve in another pint of distilled water a quarter of an ounce of pure permanganate of potash, and filter into a clean bottle as before. Draw off two separate pints of the well water in clean clear glass bottles; add to one about two fluid ounces of the tannin solution, put a new stopper in the bottle, and set it aside for forty-eight hours. To the other sample add a few drops of the permanganate solution (just enough to impart a distinct pink tinge), and note the color fade out at once or on standing half an hour. Add to another sample of the cistern water a few drops of a filtered solution of a quarter of an ounce of pure nitrate of silver in a gill of distilled water, and note whether a white precipitate or an opalescent cloudiness forms immediately or on standing half an hour in the dark. If an appreciable quantity of sewage is present in the water the tannin will occasion a flocculent or curdy precipitate, at first a mere cloud, which finally settles to the bottom as a distinct precipitate. In the permanganate test the color imparted will soon fade out if it does not do so at once. The white precipitate or cloud forming on the addition of silver nitrate also indicates the presence of contaminating substances, especially if the other tests are positive. If the tannin and permanganate reactions indicated are marked the water is unfit for potable purposes.

(2) F. B. asks: How can I keep a tent made of thin cotton cloth from mildewing without coloring the cloth? A. Saturate the cloth first with a solution of soap and then with a strong aqueous solution of lead acetate or alum. Let it partially dry, then rinse with clean water.

(3) A. V. R. asks: Can you tell me of glue to use for cigarettes? I have used flour paste, but it is not quick enough. The glue must not discolor the paper, and when dry must not show. Could you inform me what is used by the manufacturers of cigarettes? A. Thick starch paste free from lumps and containing a trace of clove oil to keep it sweet answers admirably.

(4) H. C. F. asks for a receipt for packing eggs in summer to keep for winter. A. Dip the eggs in a solution of 2 oz. gum arabic in a pint of cold water, let them dry and pack in powdered well burned charcoal.

(5) C. H. H. asks how to make potash water glass? A. Potash water glass is prepared by intimately mixing two parts, by weight, of pure white silicious sand or clear quartz, and six parts of anhydrous carbonate of potash, all ground to a very fine powder, and melting the mixture in a large clay crucible at a bright red heat. Carbonic acid gas is given off rapidly, and as soon as this ceases and the mass is in a state of calm fusion it is poured out on an iron plate to cool. This glass dissolves readily in boiling water, and on cooling the solution a sirupy liquid is obtained. This is the potash water-glass referred to.

(6) C. J. H. asks (1) how aniline is prepared and shaped which is used with the indelible writing pencils. A. A mixture of chalk and kaolin is made into a stiff paste with a strong aqueous solution of aniline violet (or other soluble aniline dye) containing a little gum dextrine, pressed into shape and slowly dried. 2. How to make brass, such as is used for cheap rings and sleeve buttons, that will keep its luster and not make the fingers and cuffs black? A. We know of no practical way. 3. How celluloid is prepared and put on linen such as is used for waterproof collars and cuffs? A. Celluloid is composed of nitrocellulose or soluble cotton combined with camphor by means of strong pressure and heat, under which conditions it is quite plastic.

(7) A. K. asks: 1. Does water ever get too cold to freeze? If so, under what circumstances does it pass the freezing point without congealing? A. At a temperature of about 32° Fah. pure water congeals under all circumstances. 2. Is the sugar that is in the maple sap taken from the ground, or is it manufactured from the material taken from the ground by the organs of the tree? A. A portion of the substances of which maple sugar is composed is derived from the soil, and a larger port on from the air. The sap is formed by chemical reactions within the tree. 3. Will evaporation be more rapid if a lid be placed over vessel while boiling? A. No; the contrary.

(8) J. D. S. asks how to make brick burn a dark color. I have been using coal dust, which does not prove satisfactory. I have an amount of fire clay among the clay, which, when moulded, burns a very light color. A. Spray the clay while mixing with a small quantity of a solution of 1 lb. common green copperas in 4 gallons of water. Or use as a cheap substitute for this, ordinary acetate of iron liquor.

(9) J. S. H. writes: I have a large marble slab, with two large hair oil stains on same. What can I use to take out the oil or to make it all oil? Have tried several oils but with no effect? It has been on for six years, and has soaked through. What is a cheap way to fix it? A. Make dry slaked lime into a paste with one ounce of washing soda dissolved in half a pint of hot water. Rub this into the spots and let it remain on over night. Then wash off with clean water. Repeat if necessary.

(10) C. W. K. asks how to remove common black ink from parchment. A. Moisten the spots first with a strong solution of oxalic acid, then with a clear saturated aqueous solution of fresh chloride of lime (bleaching). Absorb excess of the liquids from the paper as quickly as possible, with a clean piece of blotting paper. Repeat the treatment if necessary, and dry thoroughly between blotting pads under pressure.

(11) C. L. asks: Can you tell me how to dissolve rubber so as to make rubber stamps? A. The rubber is not dissolved. See "How to Make Rubber Stamps," SUPPLEMENT, No. 83.

(12) H. E. writes: I have some receipts for making colored fires; among them are some articles termed meal powder and Chertier's copper. What are these substances? A. The first is gunpowder reduced to a fine flour; the second, fine copper filings made into a paste with an equal weight of finely powdered potassium chlorate and enough hot water, then thoroughly dried.

(13) W. W. asks about what steam pressure a mercury flask will stand. Will it be safe to put 40 to 50 lb. pressure in them? A. It will be safe at three times 40 or 50 lb.

(14) "Subscriber" asks: What would be the cheapest and best style to make a boiler for an engine 1½ inch cylinder, 3 inch stroke; whether upright or horizontal, and of what material? Also, would oil lamp or lamps give out sufficient heat, and what part of a horse would the above be? A. A vertical tubular boiler of iron. Petroleum or kerosene lamps might be arranged to heat it. Engine would be half horse power to one horse power, according to steam pressure and velocity at which it is run; 2 inches by 4 inches cylinder would be about double the power.

(15) C. E. T. asks: Is there any difference between the power required to punch a hole in iron one inch in diameter and one inch thick, and the power required to punch a hole two inches in diameter and one-half inch thick? A. According to the result of experiments, the power required for punching iron plates is directly as the area of the boundary of the hole, or as the circumference multiplied by the thickness.

(16) J. D. S. writes: My engineer and I are in dispute on the following points, and appeal to you for an opinion. We wish to draw water from a stream to the sugar house, four hundred yards distant. Have a Blake pump, and will use a three-inch iron pipe for the suction. From the level of the water to the pump is 20 feet perpendicular. From the level of the water to the top of bank, near the stream, is 22 feet. Now, will it be better to lay the pipe with a gradual fall throughout, from the pump to the water, or to make a perpendicular lift at the stream which will carry it over the bank, and then fall gradually back toward the pump, which is two feet lower than the top of the bank near the stream? My engineer says it should be put with the fall from pump to water, and use thin check valves in the length of the pipe. I hold the contrary opinion, and especially that more than one check valve is worse than useless, as it is only an additional weight for the pump to lift. He insists that he can, by laying a pipe as he says, and with several check valves, make a pump raise water forty feet perpendicularly with ease. A. If the pipe is tight, it makes little difference which plan is adopted. Your engineer is "all wrong" in saying that he can lift the water 40 feet by using a number of check valves. A multiplicity of check valves increases the difficulty.

(17) J. R. D. asks: 1. What is the best lubricant for two wood surfaces? A. Pure refined tallow or lard, with a little black lead. 2. What is the formula for finding the theoretical horse power of a given head of water? A. One horse power is 33,000 lb. lifted 1 foot high per minute. For water power multiply the weight of water falling over the dam per minute by the amount of fall and divide by 33,000, the result is the theoretical horse power. When applied to water wheels the net power is from 60 to 80 per cent, according to the kind and perfection of the wheel.

(18) G. E. asks: How can I make the so-called liquid slating for blackboards? A. Shellac, 1 lb.; borax, 1 lb.; water, 4½ gallons. Heat the water to boiling, add the borax, and when this is dissolved gradually add the borax, and continue the boiling until the latter is dissolved; then introduce lampblack, 2 oz.; silicate of soda (a sirupy solution), 8 oz.; fine silica, 1½ lb. Stir well together and add enough hot water to reduce it to the proper consistence for use.

(19) S. C. D. asks if brass pipe for conducting water for domestic use would be safe; would water so conducted and at times standing in brass conducting pipes, be perfectly free from any poisonous or injurious properties, and positively safe to use? A. Brass is not a proper material for pipes conveying potable water. Water that has remained in such pipes for any length of time is not fit to drink or for cooking. Use iron or wood pipes.

(20) M. R. P. writes: I am painting with oil colors on gold and silver leaf. To preserve the brightness of the painting some kind of varnish is necessary. What kind can I use so as not to damage the gold or silver leaf? A. Photographer's clear plain collodion answers very well.

(21) W. H. B. asks: Is there anything that will neutralize the oxide of iron in glass sand, which in melting renders the glass dark colored and full of sand or small blisters? A. The introduction of a little oxide of manganese will improve though it will not eradicate the color. Fine glass cannot be made from such sand.

(22) G. M. P. asks: What is the proportion of coal to the amount of glass melted in the manufacture of glass table ware? A. In the old method of melting glass it required 1½ pounds of coal to melt a pound of glass; in Germany, where coal is expensive, the glass manufacturers claim to be able to melt a pound of glass with a pound of coal. There are glass melting furnaces running successfully in Pittsburg, which melt seven pounds of white glass for table ware with one pound of coal.

(23) E. W. M. asks: What is the nutritive value of fish as food as compared with other articles of flesh diet? A. According to Professor Atwater: Taking medium beef at 100, we should have, as the nutritive value of like weights of fish free from bone: Medium beef, 100; fresh milk, 23 8; skimmed milk, 18·5: butter, 124; cheese, 155; hens' eggs, 72; codfish, fresh, 68; flounders, 65; halibut, 88; lake trout, 91; eels, 95; shad, 99; salmon, 104; salt mackerel, 110; dried codfish, 346.

(24) R. H. asks: Are there any coal mines successfully worked under the sea? A. A number of English coal mines are being worked under the ocean. In Northumberland the net available quantity of coal under the sea is estimated at 403,000,000 tons, and on the Durham coast under the sea, including a breadth of three and a half miles with an area of seventy-one square miles, 734,500,000 tons. The latter mine is in a vein of an aggregate thickness of thirty feet, distributed in six seams.

(25) T. A. W. asks how much lap there is on the steam and exhaust valves of the Corliss engine; also, if there is any way of setting the valves except to take off the cylinder heads. A. The lap is different in the different sizes of engines and engines running at different velocities. You can set the valves by having the position of the openings and the section of the valve marked at some proper place on the outside.

(26) W. L. asks why the screw propeller is used in preference to the paddlewheel for ocean navigation. A. Because: 1. The machinery weighs less and occupies less room than for paddlewheels. 2. Its propelling power is not so much affected by the varying draught of water. 3. Its propelling effect is not reduced in a sea way and by the rolling of the ship, as is the case with paddle wheels. 4. It is much less liable to damage from heavy seas.

(27) J. B. asks if an engine of the following dimensions is well proportioned: Cylinder 7x20, with a two-flue boiler. What is the horse power of such engine and what sized boiler is required? A. Your proportions are very good, unless you wish to run at a high velocity, then a shorter stroke will be better. The engine, will develop about 23 horse power at 120 revolutions per minute. Boiler 38 inches diameter by 23 feet long, 2 flues 12 inches diameter. Of the speed of the engine is less than 120, a smaller boiler will answer.

(28) W. E. F. L. asks: What is the cheapest way to magnetize small steel bars to saturation? The bars are from 2 to 3 oz. in weight. A. You will find full information on this subject on page 379 (36), SCIENTIFIC AMERICAN, for December 11, 1880, vol. xliii.

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(29) W. B. R. asks how to soften hard cast iron so that it can be filed and fitted easily. The castings we want to use are so thin that heating breaks them. A. The metal may be superficially softened by packing the pieces in dry oxide of iron or powdered hematite iron ore in an iron box, heating the whole to redness and keeping up the heat for twenty-four hours or more. The contents of the box must be allowed to cool down slowly

(30) T. M. inquires as to the action of glue on porcelain, when allowed to dry in a porcelain evaporating dish. The glue causes the glazing to crack and flake off. I placed some glue in a glass vessel, and found that when it solidified and contracted it caused the glass to flake. If this is a common case I have failed to notice it before. Is it due to mechanical action alone? A. The flaking of porcelain and glass surfaces by glue in drying has been frequently noted. The only requisite is that the glue be strong and hot and the vessel clean. It is due to mechanical action.—Your minerals were reported under appropriate headings in a recent issue.

(31) C. H. asks for a good work on amalgamating and milling. We are running over silver plated copper plates, using cyanide of potassium to clean with, but cannot get the plates in good order, the quicksilver running off. What should we use to prevent this? A. Consult Percy's "Metallurgy of Gold and Silver." Address the book dealers who advertise in this paper. Wash the plates with a strong hot aqueous solution of caustic potash. Rinse off thoroughly with water, then try the mercury, with a little dilute nitric acid if necessary, at first.

(32) J. H. asks: 1. Is it lawful for any one to make a patented article, without permission from the owner of the patent, providing the person makes it for his own use solely, and not to sell? A. Any one may make a patented article for experimental purposes, but not for actual use. See "Rights of Investigators," page 128, vol. xxxix. 2. What would be proper size, bore of cylinder, and stroke for engine of steam launch, 33 feet keel, 8 feet beam, to make seven miles an hour? A. 7 to 8 inch cylinder by 8 inch stroke. 3. The amount of pipe necessary to make a coil boiler for such an engine? A. There should be pipe enough in coil boiler to give not less than 300 feet surface.

(33) W. F. K. writes: I have a small stream of spring water about 20 inches square, or rather 20 square inches as it runs, that is 10 inches wide and 2 inches deep, could raise the head to 20 feet high. Would like to know the best water wheel to get, and what would be the greatest amount of power that could be got out of the water under a 20 foot head? A. We cannot tell anything about the power, as you do not give the quantity of water per unit of time. A turbine is the best wheel for you. Address dealers who advertise in our columns.

(34) M. F. J. asks: 1. Can a reliable watch be affected or made to go faster, on account of its owner taking shocks from a small induction coil? A. No. 2. Can an induction coil be compared to a dynamic machine for lights? A. No, it would be impossible to substitute one for the other. An induction coil is not adapted to electric light purposes.

(35) W. C. B. writes: I have tried to put up an acoustic telephone, from office to dwelling, distance about 200 feet, and cannot get it working satisfactory. There seems to be too much vibration or buzzing noise in the diaphragm, as though the words spoken could not get out fast enough. Will you please state through correspondence column, SCIENTIFIC AMERICAN, where the fault lies? My boxes are 6x6x6 inches, with drumhead diaphragm 6 inches square, forming a slight cone, with a cover over the front and around hole of 4½ inches in that cover, forming a small chamber in front of diaphragm of about half an inch. Back of diaphragm I have packed cotton to partly take away that vibration. I use common iron wire insulated with string (wire is about one-thirty-second of an inch thick), forming four right angles. Wire is moderately taut and does not touch anywhere but the diaphragm and strings to form the angles. There seems to be no difficulty as to quantity of noise; we can hear that very plainly 20 feet away from box; only as to distinctness, we have experimented every way, and cannot strike the right thing. A. Your diaphragm is too large. Make it from 2 to 2½ inches in diameter, of thin sheet iron (ferrotype plate) or tin, and turn your corners with an angle less acute than a right angle; that is, use two or three suspenders at the corners instead of one.

(36) Dr. N. J. S. writes: When sheets, handkerchiefs, and other linen or cotton fabrics are soiled with vaseline, and afterwards washed in soap suds or boiled in lye, the stain disappears. When the articles are ironed, however, the heat causes the stain, which looks like a grease spot, to reappear. Neat patients complain that their bed linen and clothing is thereby rendered unfit for use. What is the remedy? A. The best way is to put the stained pieces to soak for ten or fifteen minutes in a quantity of deodorized benzine (a common commercial article) sufficient to completely cover them. Wring out and hang up the pieces for about ten minutes, when they will have dried sufficiently to put in the soap suds.

(37) J. A. D. writes: I have a Niagara pump, 4 inches suction and 2 inches discharge, and I cannot make it pump hot water it pumps cold water all right. Can it be made to pump hot water? The valves and rings are all metal. The heater is an old boiler (with the flues taken out and the ends closed up), 24 feet long, 40 inches diameter, and the exhaust goes through it. Cold water is pumped into the heater with a Blake pump. The heater sits 4 feet above the pump, and it is to supply seven boilers 25 feet long, 40 inches dameter, with two flues carrying 90 lb. of steam. As soon as the water gets hot in the heater, after running half an hour it pounds bad and blows out the packing from the water cylinder. I took off the air chamber, and it worked a little better, but not much. A. The hot water produces a vapor in the pump which prevents the valves from acting, especially if there are large vacant spaces in the pump; it would work better if the tank were 10 or 12 feet or more above the pump instead of 4 feet; any good force pump will pump hot water if the supply of water is a good height above the pump. Write the manufacturers of your pump.

(38) H. O. asks how to charge horseshoe and bar magnets. A. The quickest and best way to magnetize steel bars is to place them centrally in a suitable coil, and then connect the helix with the wires from a dynamo-electric machine or powerful battery for a few seconds, remembering to break the current before removing the magnet from the coil. If the source of the current is a dynamo machine, the coil should be about 2½ inches long, and should consist of ten or twelve layers of No. 12 magnet wire. If a battery is used, a coil 1½ inches long, composed of fourteen or sixteen layers of No. 16 magnet wire, will be the best. The internal diameter of the coil should be only large enough to admit the bars easily. A battery of six Grenet elements, each having an effective zinc surface of 30 square inches connected in series, will do the work very well on small magnets; such, for instance, as are used in telephones. Where a number of magnets are to be made at one time the bars may be passed in a continuous line through the coil, always keeping three bars in contact end to end, adding one above the coil before taking one off below. In this manner sixty bar magnets have been strongly charged in ten minutes. Horseshoe magnets cannot be charged so readily. There are two or three ways of charging them. One way is to place them in contact with the poles of a very strong electro-magnet, removing them after breaking the current; another method is to place each limb of the magnet in a coil adapted to the current to be used; and still another method is to employ a single coil, inserting one pole of the magnet into the coil in one direction, thus breaking the current, and inserting the other pole into the coil from the opposite direction. It is well to remember that the magnet will be very much impaired if the current is not broken before removing it from the coil. The secret of success in charging magnets is to have a strong current. It is impossible to make magnets satisfactorily without this all-important requisite. As to the quality of steel best adapted to this purpose, machinery steel, hardened and not tempered, answers admirably. For horseshoe magnets German spring steel is the best. Tool steel answers well if hardened and drawn to a straw color. The steel receives its maximum charge almost instantly. It is useless to allow it to remain under the influence of the magnetizing current more than a few seconds.

(39) E. R. T. asks how to make pure oxygen gas. A. Mix pure crystallized potassium chlorate with about one-quarter its weight of pure black oxide of manganese, and heat the mixture in a copper retort, with large delivery tube, until the gas begins to come over. Conduct the gas through a large empty bottle (to avoid accident by back pressure), then through a strong solution of iron sulphate (copperas), and then through an iron tube several feet in length, filled loosely with fresh quicklime in granular lumps (free from dust). Collect in a rubber bag. An ordinary mouthpiece answers well enough if the air from the lungs is expelled through the nostrils, or so as not to contaminate the contents of the bag. The heat should be continued under the retort with caution to avoid too rapid a disengagement of the oxygen until no more gas comes over.

(40) O. E. C. asks for a receipt for whitewash for out-of-door work. A. For brickwork exposed to damp take one-half peck well burned quicklime, fresh from the kiln, slake with hot water, enough to reduce it to a paste, and pass it through a fine sieve; add a gallon of clean white salt which has been dissolved in a small quantity of boiling water, and a thin smooth paste, also hot, made from 1 pound fine rice flour; also one-quarter pound best white glue, made in the water bath. Mix together, stir well, and one-quarter pound best Spanish whiting in 5 quarts boiling water, stir, cover over to retain heat and exclude dust, and let it stand a week. Heat to boiling, stir, and apply hot. The above proportions will cover 40 square yards. 2. Also the best way to refine cider for family use? A. See pp. 394 (7) and (15), vol. 39, and 299 (24) and 28 (46), vol. 38, SCIENTIFIC AMERICAN.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

F. C. R.—Iron pyrites—sulphide of iron—contains traces of gold.—A. M.—A variety of bituminous coal containing much sulphur.—E. S. H.—1. Encrinites or stone lilies. 2. Niagara limestone. 3. Fibrous talc. —R. McA.—A variety of fine silicious clay.

COMMUNICATIONS RECEIVED.

On the Mound Builders. By W. O. C.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

May 10, 1881,

AND EACH BEARING THAT DATE

[Those marked (r) are reissued patents.]

A printed copy of the specification and drawing of an patent in the annexed list, also of any patent issued since 1866, will be furnished from this office for one dollar. In ordering please state the number and date of the patent desired and remit to Munn & Co., 37 Park Row New York city. We also furnish copies of patents granted prior to 1866; but at increased cost, as the specifications not being printed, must be copied by hand.

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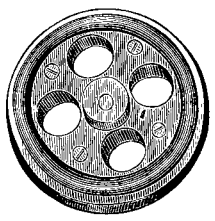

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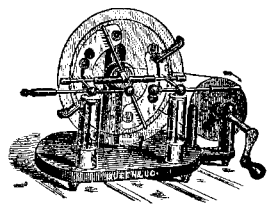

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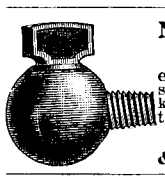

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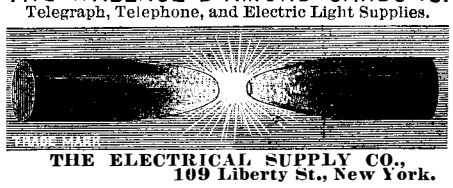

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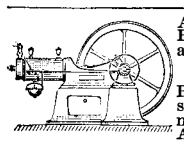

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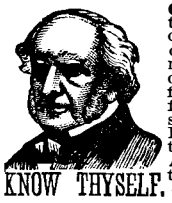

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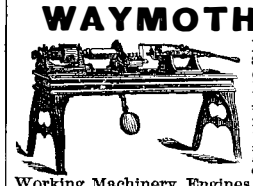

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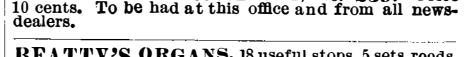

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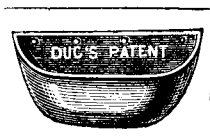

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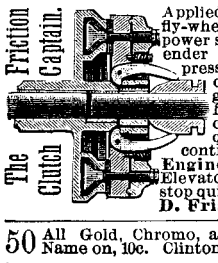

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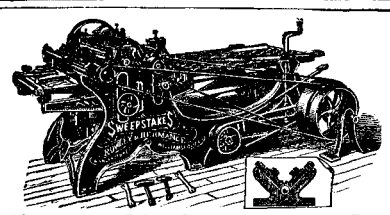

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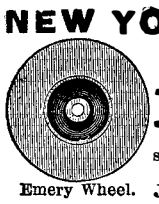

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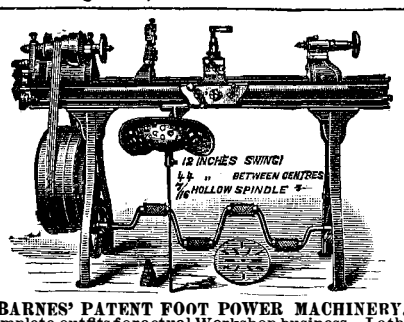

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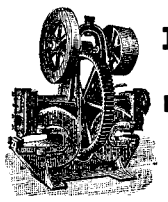

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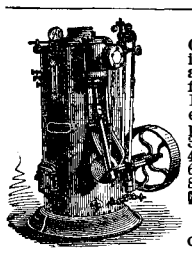

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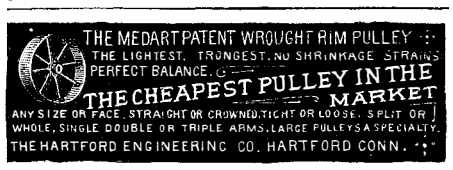
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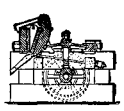

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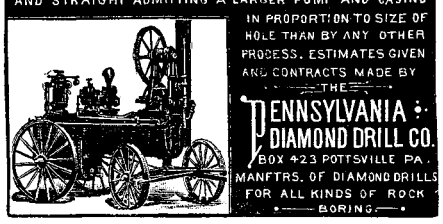
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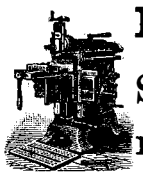

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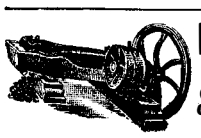

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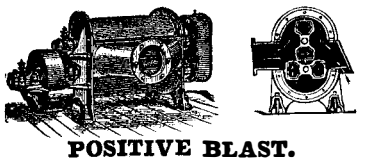

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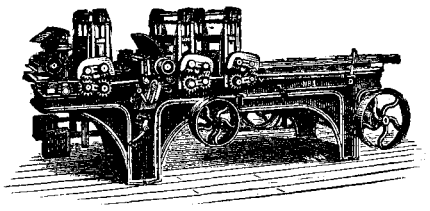

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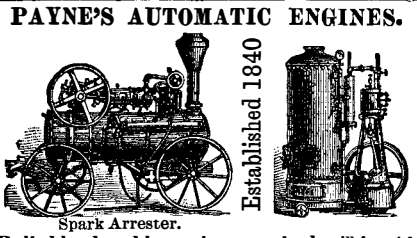

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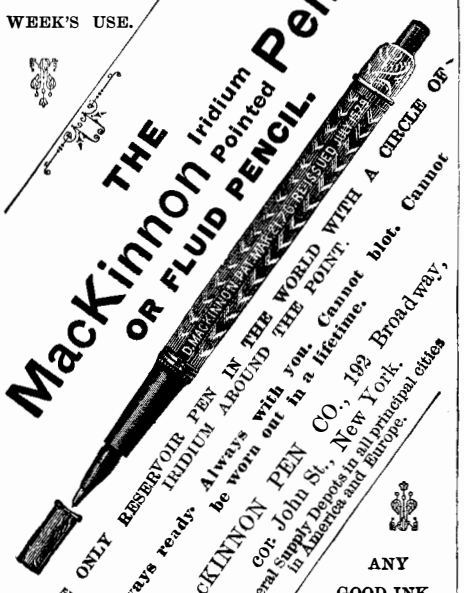
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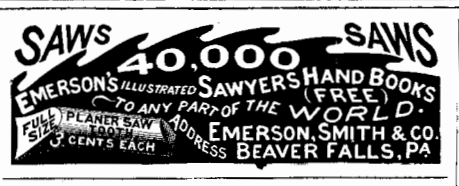
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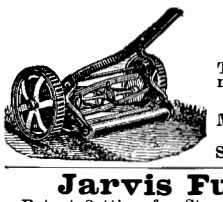

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